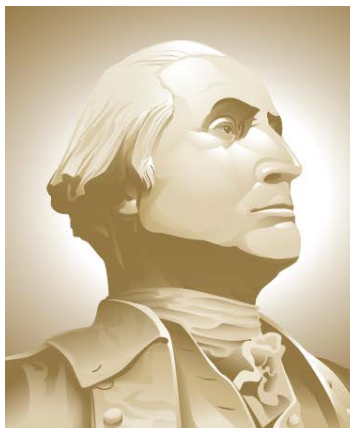


VTRA PRELIMINARY GATEWAY ANALYSIS

A 2005 Exposure Analysis Comparison

Presentation by: J. Rene van Dorp



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GWU Personnel: Dr. J. Rene van Dorp

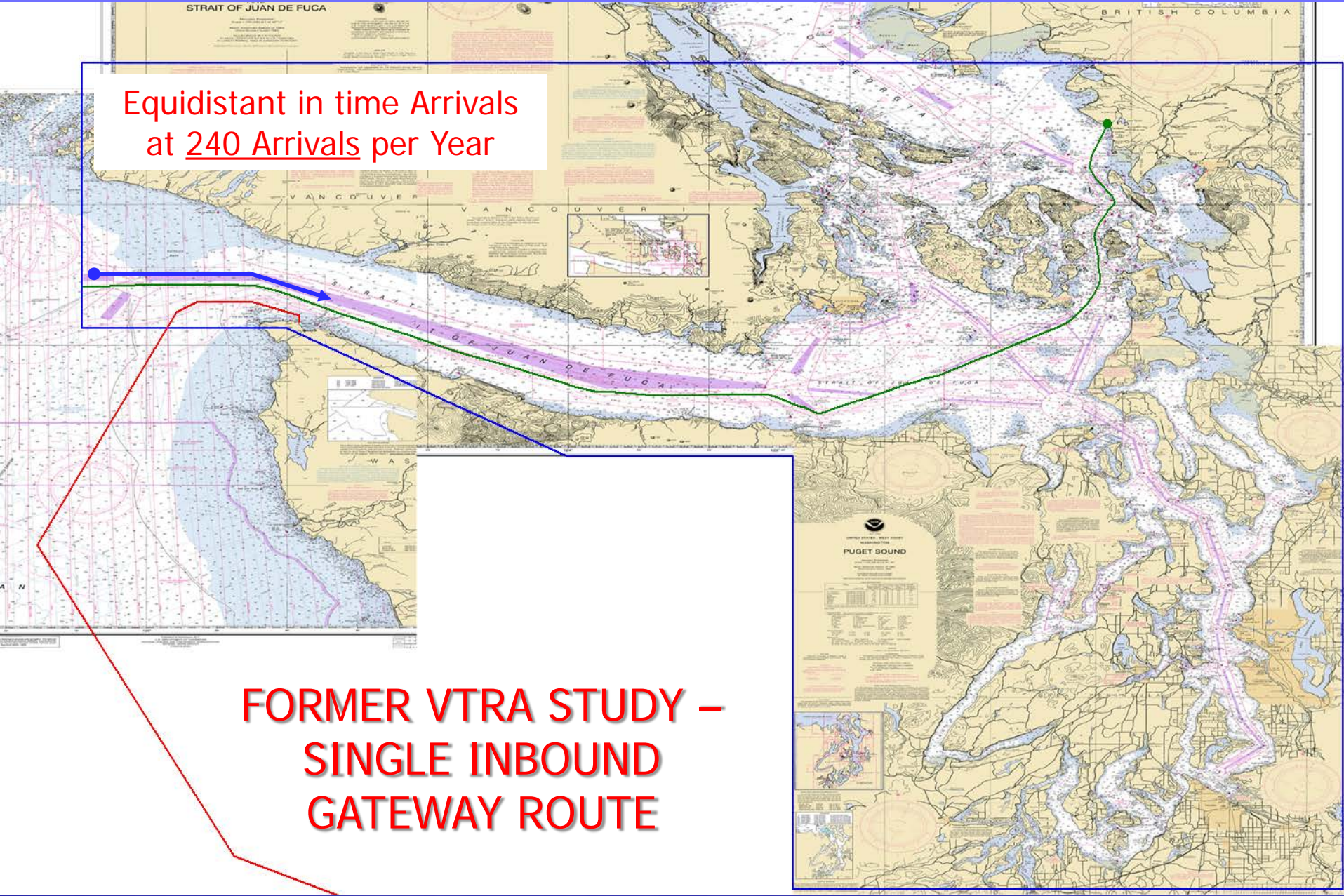
VCU Personnel: Dr. Jason R. W. Merrick

Updated : 12/18/2012
Puget Sound Harbor Safety Committee Presentation
December 2012

FORMER VTRA STUDY – GATEWAY TRAFFIC MODELLING

Equidistant in time Arrivals
at 240 Arrivals per Year

FORMER VTRA STUDY –
SINGLE INBOUND
GATEWAY ROUTE



CURRENT VTRA STUDY – GATEWAY TRAFFIC MODELLING

Equidistant in time Arrivals
at 240 Arrivals per Year

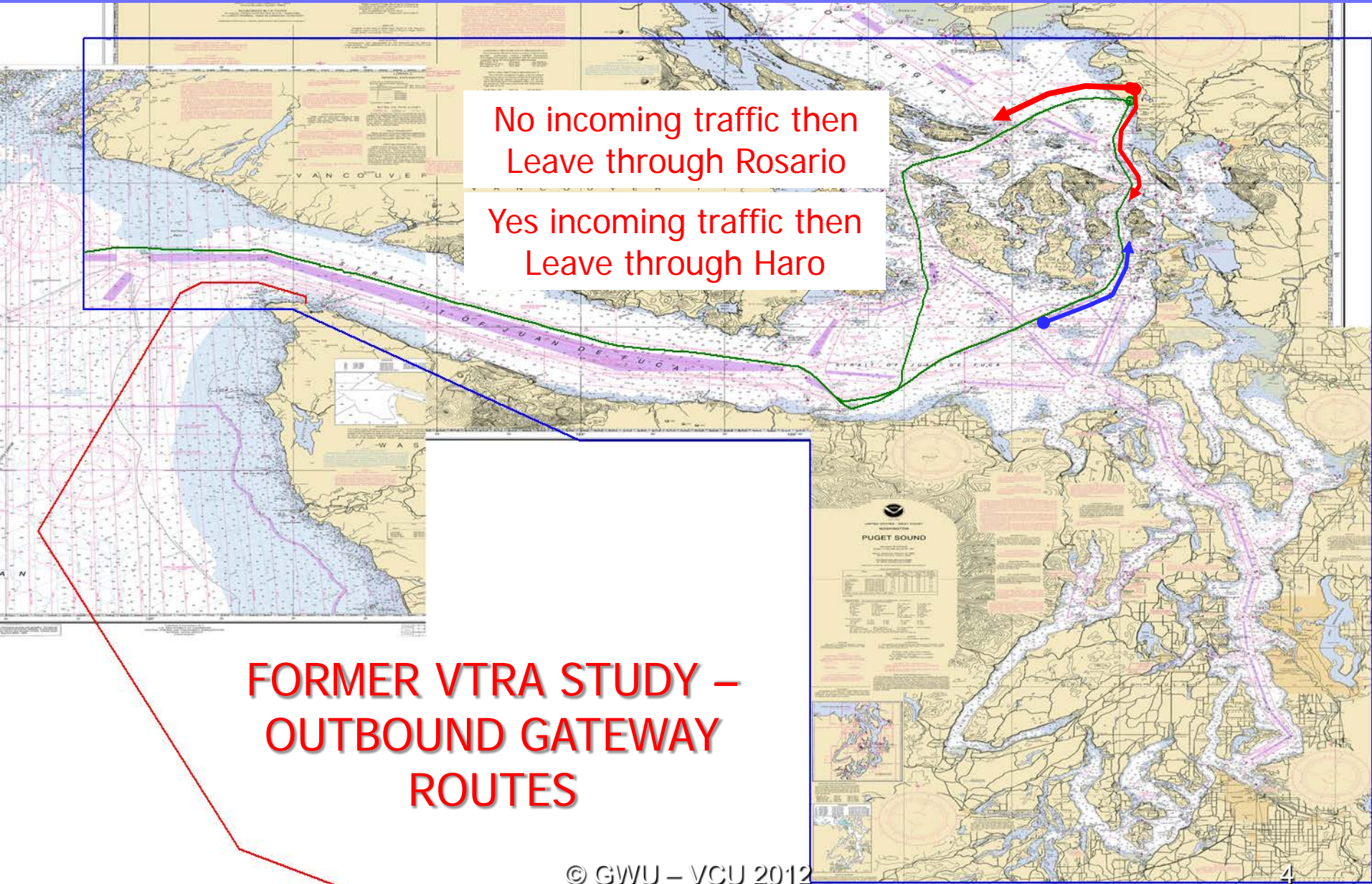
Equidistant in time Arrivals
at 480 Arrivals per Year

Rosario free then go
through Rosario

Yes incoming traffic then
go through Haro

**VTRA 2005 TRAFFIC – ADD
INBOUND GATEWAY OPTION
THROUGH HARO/BOUNDARY**

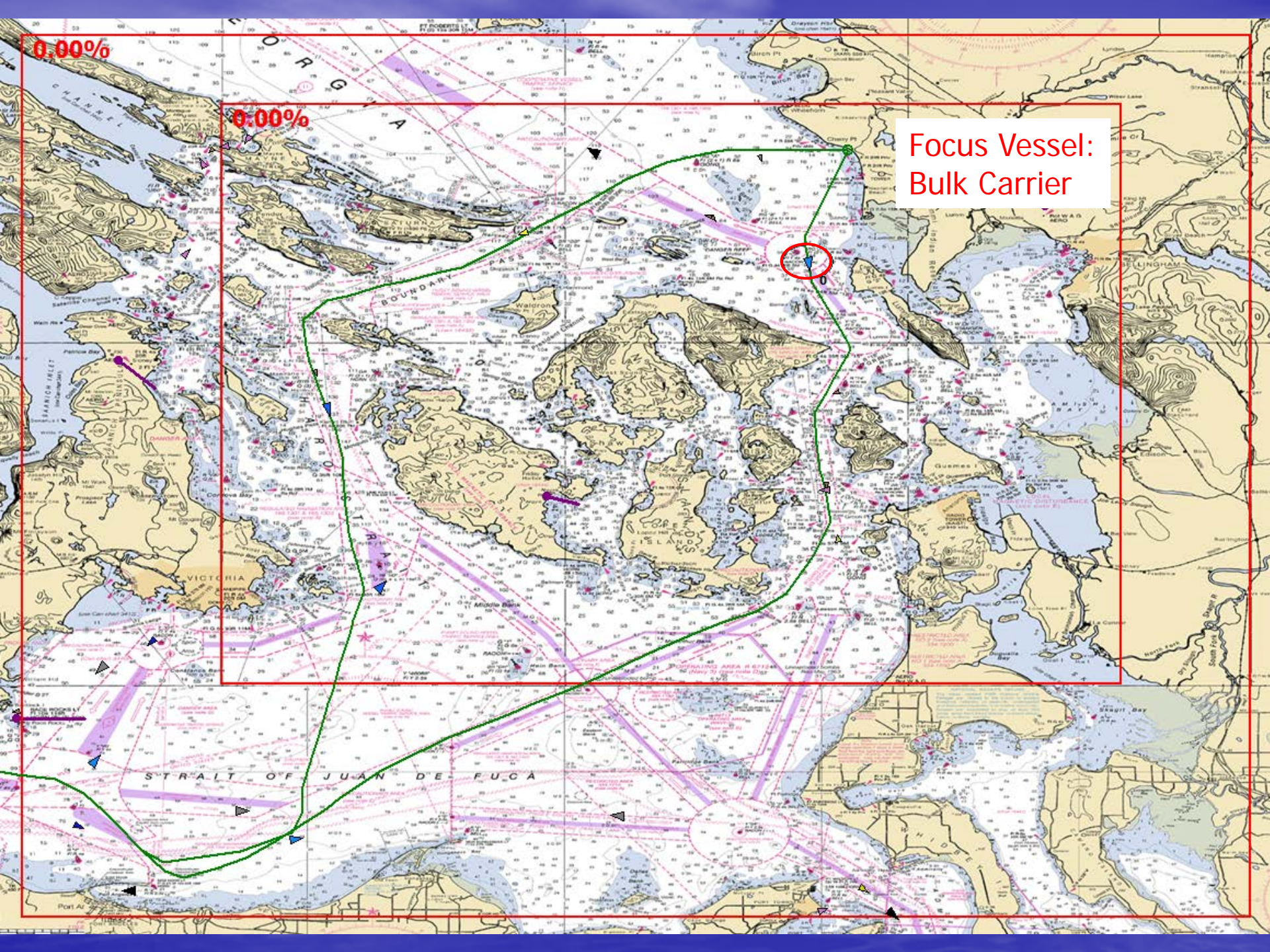
FORMER VTRA STUDY – GATEWAY TRAFFIC MODELLING

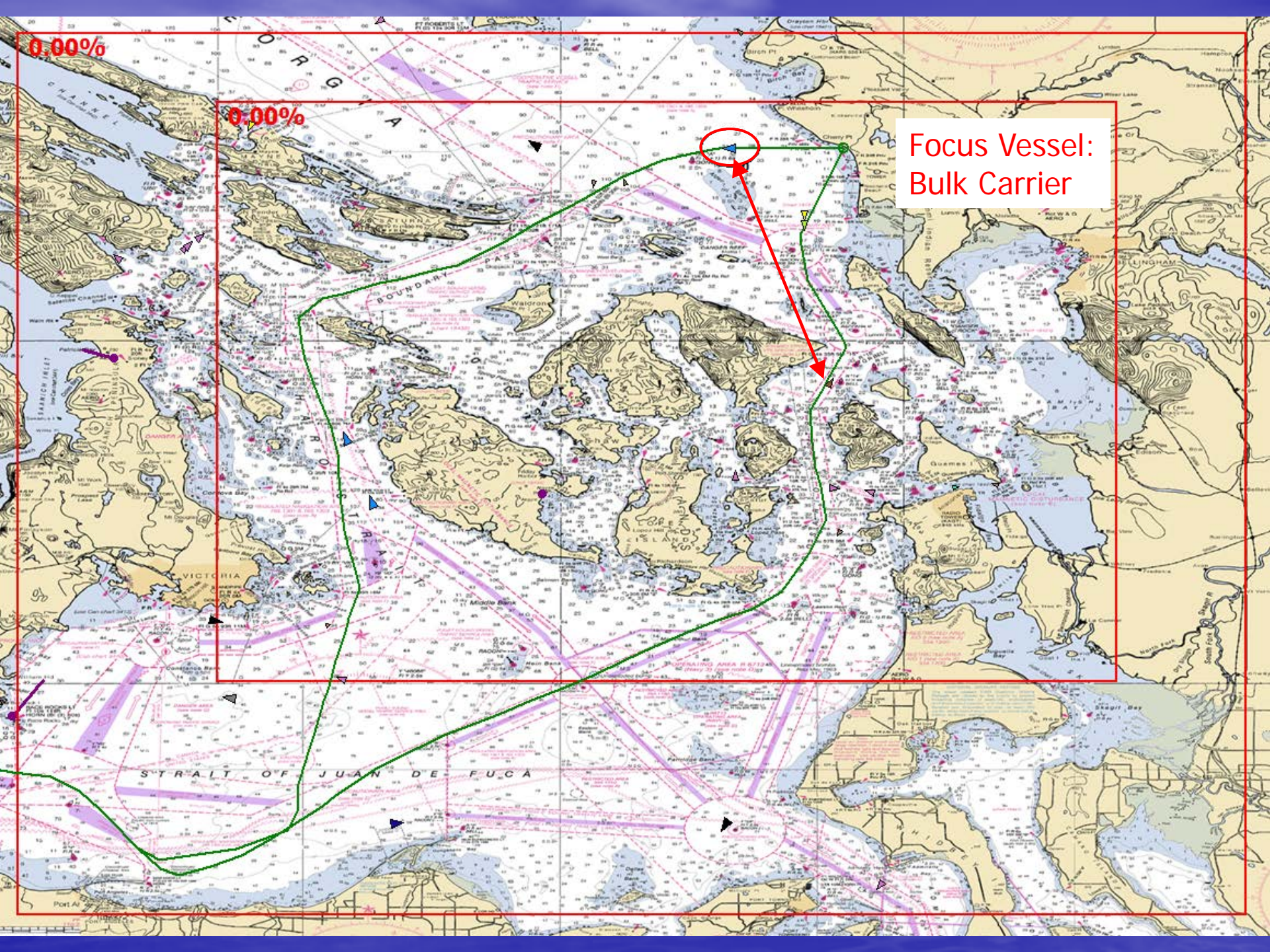


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Focus Vessel:
Bulk Carrier



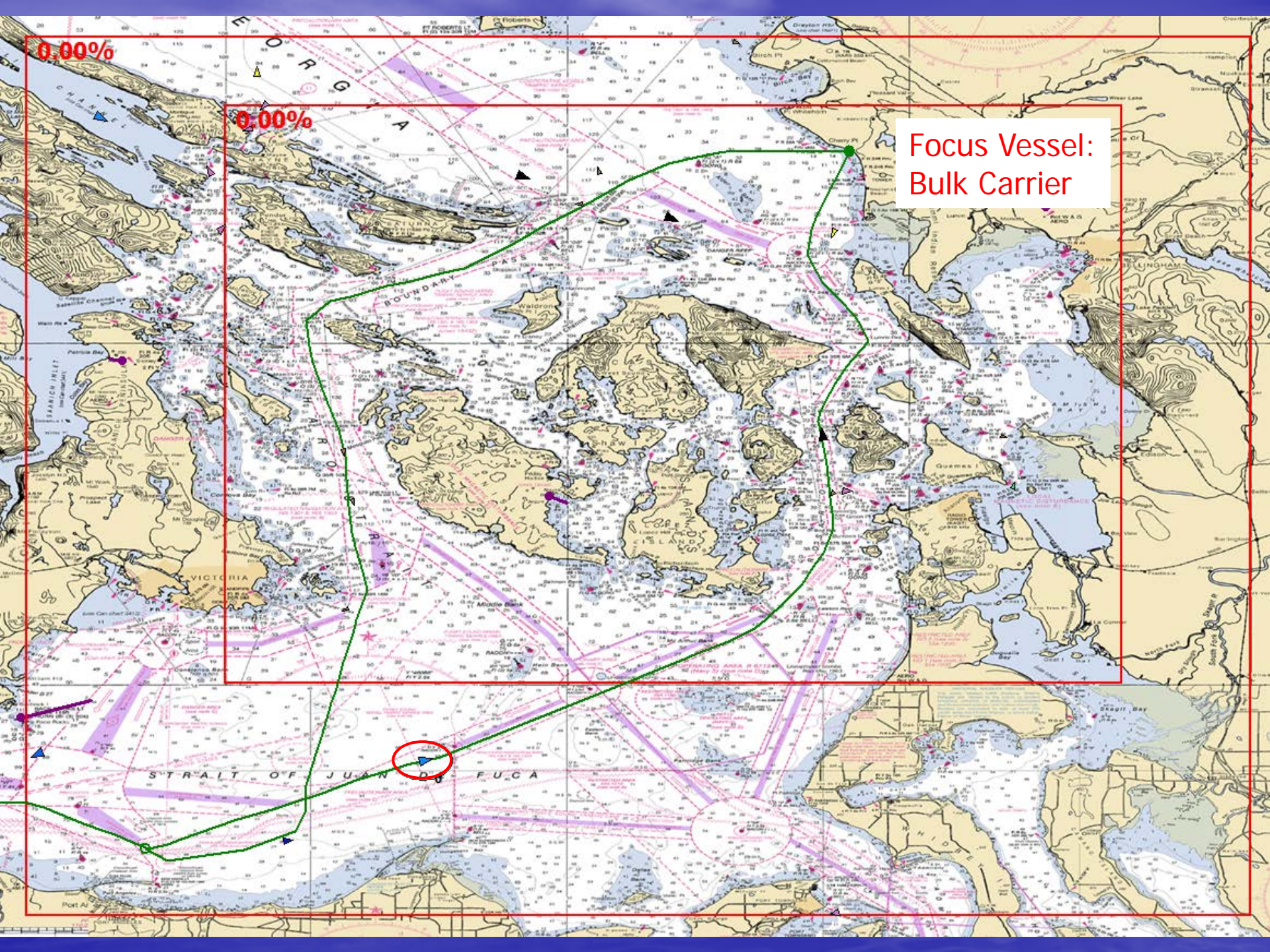


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Focus Vessel:
Bulk Carrier

STRAIT OF JUAN DE FUCA

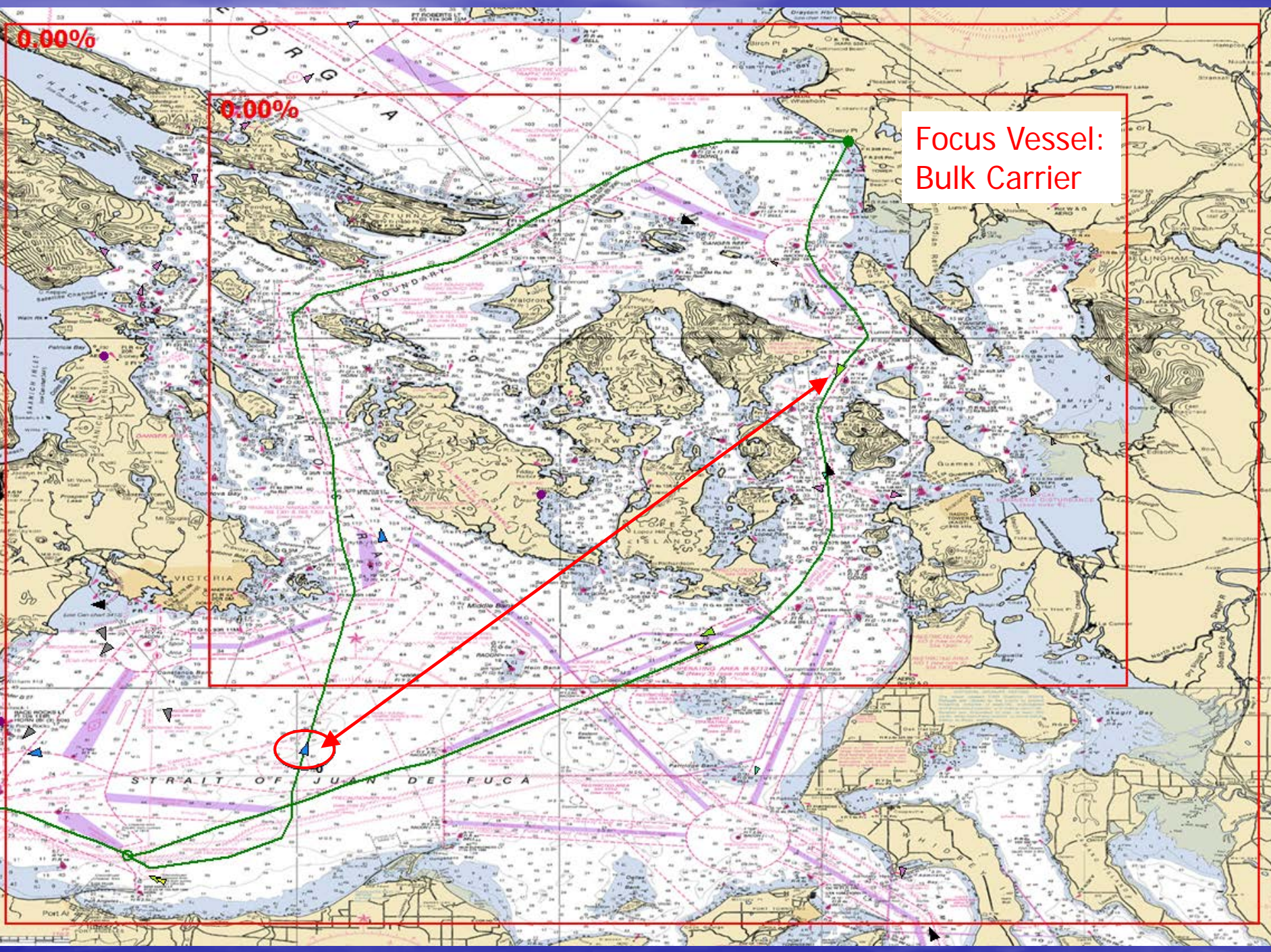


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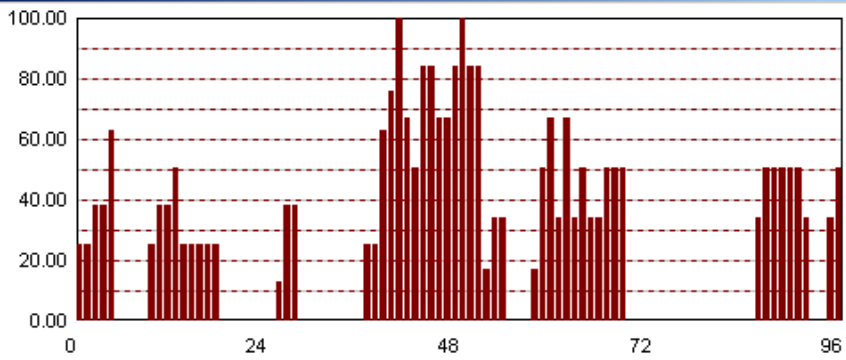
Focus Vessel:
Bulk Carrier

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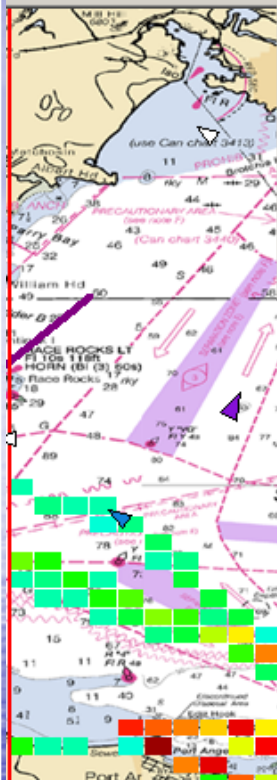


Focus Vessel:
Bulk Carrier

Exposure History per Hour



X-Axis: Hours Passed Y-Axis: % of Maximum Historical Exposure



Data base - Vessel Interactions

Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	No of Occurrences
425120095	410901300	110222107	111122130	628013199	121094074	301132018	2
425121095	410901300	110222107	111122130	626009190	126094032	223021000	1
425121095	410901300	110222107	111122130	628013199	122094074	301132018	1
425121095	410901300	110222107	111122230	626009190	126094032	223021000	1
425121095	410901300	110222107	111122230	628013199	122094074	301132018	1
425126095	410901300	110222107	112122130	626009190	127094032	223022018	3
425127095	410901300	110222107	112122130	626009190	127094032	223022018	4
425128095	410901300	110222107	112122130	626009190	127094032	223022018	2
425174081	321004200	120262107	111112130	626009190	176082032	223032000	1

type INTERACTION - record

```

lex_number_1 : longint;
lex_number_2 : longint;
lex_number_3 : longint;
lex_number_4 : longint;
lex_number_5 : longint;
lex_number_6 : longint;
lex_number_7 : longint;

{Index 1 - VOI Location Info}
Interaction_Type : longint; { 400000000}
VOI : longint; { 26000000}
VOI_X : longint; { 500000}
VOI_Y : longint; { 500}

{Index 2 - VOI Attributes}
VOI_Location : longint; { 900000000}
VOI_Inbound_Outbound : longint; { 20000000}
VOI_Speed : longint; { 3000000}
VOI_DP : longint; { 12500}
IV_Cargo : longint; { 20}
IV_Barge_Type : longint; { 5}

{Index 3 - VOI Attributes}
VOI_Cargo : longint; { 20000000}
VOI_Tethered_State : longint; { 200000}
VOI_Barge_Type : longint; { 50000}
VOI_Hook_Up : longint; { 4000}
VOI_ID : longint; { 999}

{Index 4 - Environment Info}
Visibility : longint; { 20000000}
wind_Direction : longint; { 2000000}
Wind_Speed : longint; { 400000}
Current : longint; { 30000}
Current_Direction : longint; { 3000}
N_Vessels : longint; { 300}
Escort_State : longint; { 20}

{Index 5 - Shore Interaction Location}
Shore_X : longint; { 500000000}
Shore_Y : longint; { 500000}
Time_To_Shore : longint; { 300}

{Index 6 - Interacting Vessel Location}
IV_X : longint; { 500000000}
IV_Y : longint; { 500000}
IV_DP : longint; { 125}

{Index 7 - Interacting Vessel Info}
IV_TrafficScenario : longint; { 400000000}
IV_TrafficType : longint; { 25000000}
IV_Speed : longint; { 300000}
IV_ProxVessel : longint; { 2000}
IV_InterAngle : longint; { 180}

end;
    
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A

2005 VTRA DATA – THREE FOCUS VESSEL SCENARIOS

SCENARIO 1	SCENARIO 2	SCENARIO 3
BULK CARRIERS	CHPT OIL TANKERS	OIL TANKERS
	CHPT ATB'S	ATB'S
	CHPT ITB'S	ITB'S

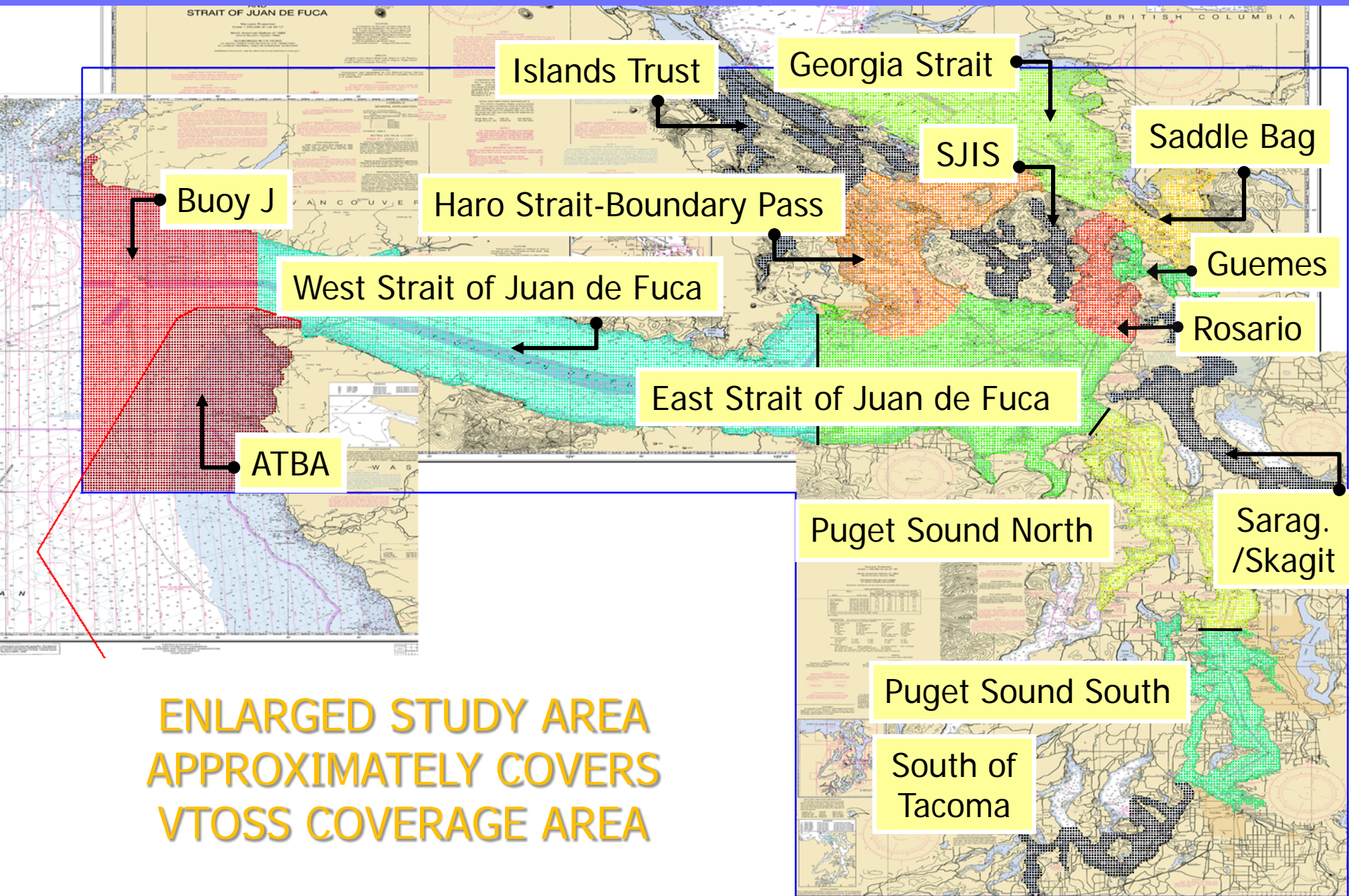
Focus Vessels:	Base Case	Case 1	Case 2	Case 3	Case 4
Bulk Carriers	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls					≈ 480

15 different cases!

Focus Vessels: CHPT Oil Tanker, ATB, ITB	Base Case	Case 1	Case 2	Case 3	Case 4
	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls	N/A	≈ 240	≈ 240	≈ 480	≈ 480

Focus Vessels: Oil Tanker, ATB, ITB	Base Case	Case 1	Case 2	Case 3	Case 4
	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls	N/A	≈ 240	≈ 240	≈ 480	≈ 480

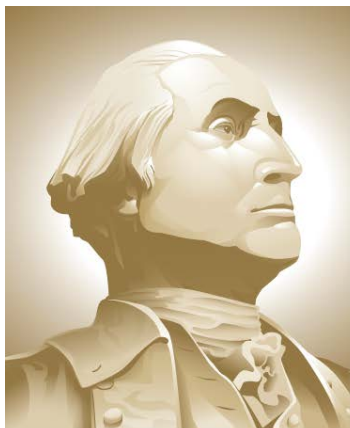
FOR UPDATED VTRA STUDY - 15 DEFINED LOCATIONS



VTRA PRELIMINARY GATEWAY ANALYSIS

A 2005 Exposure Analysis Comparison

Presentation by: J. Rene van Dorp



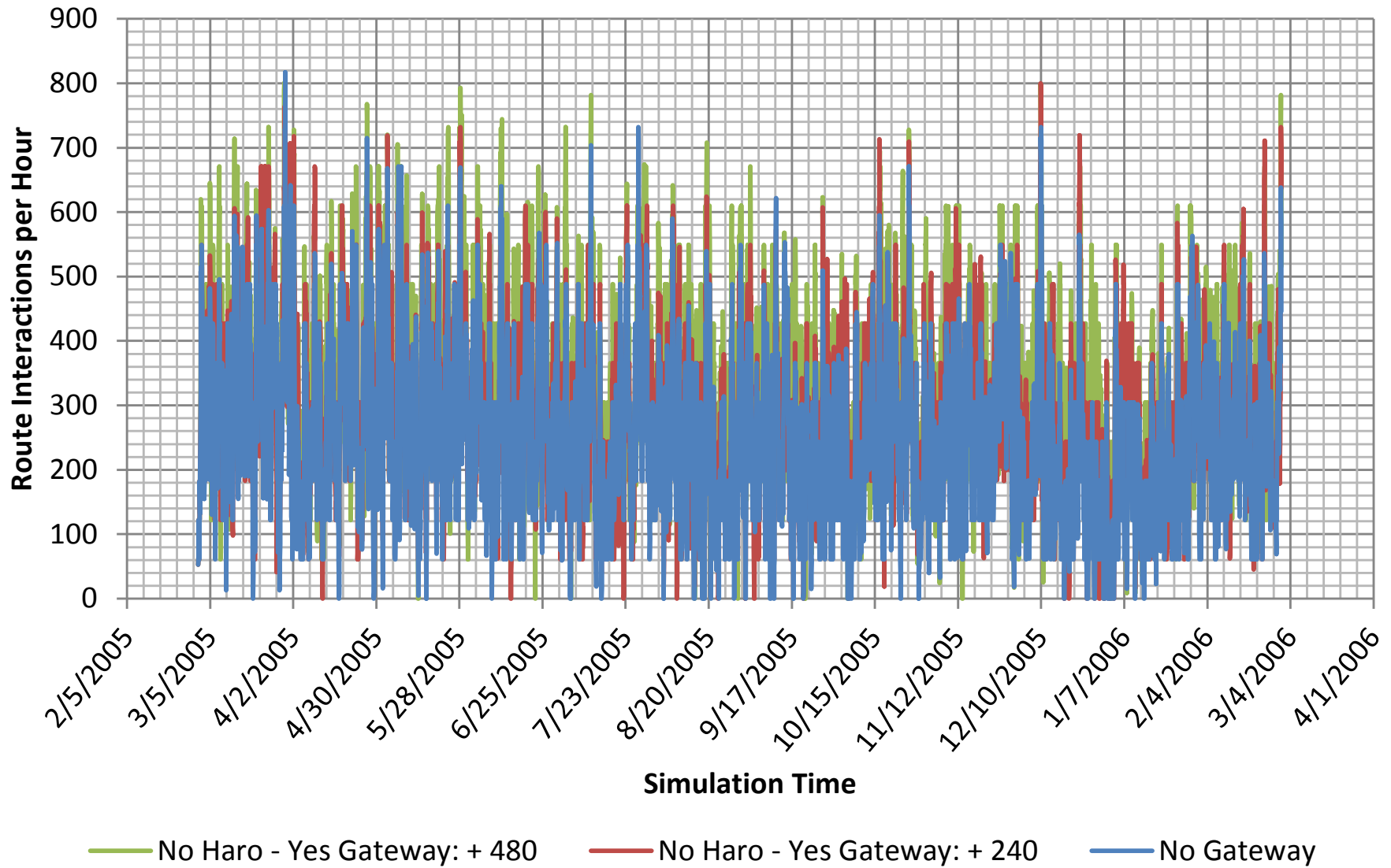
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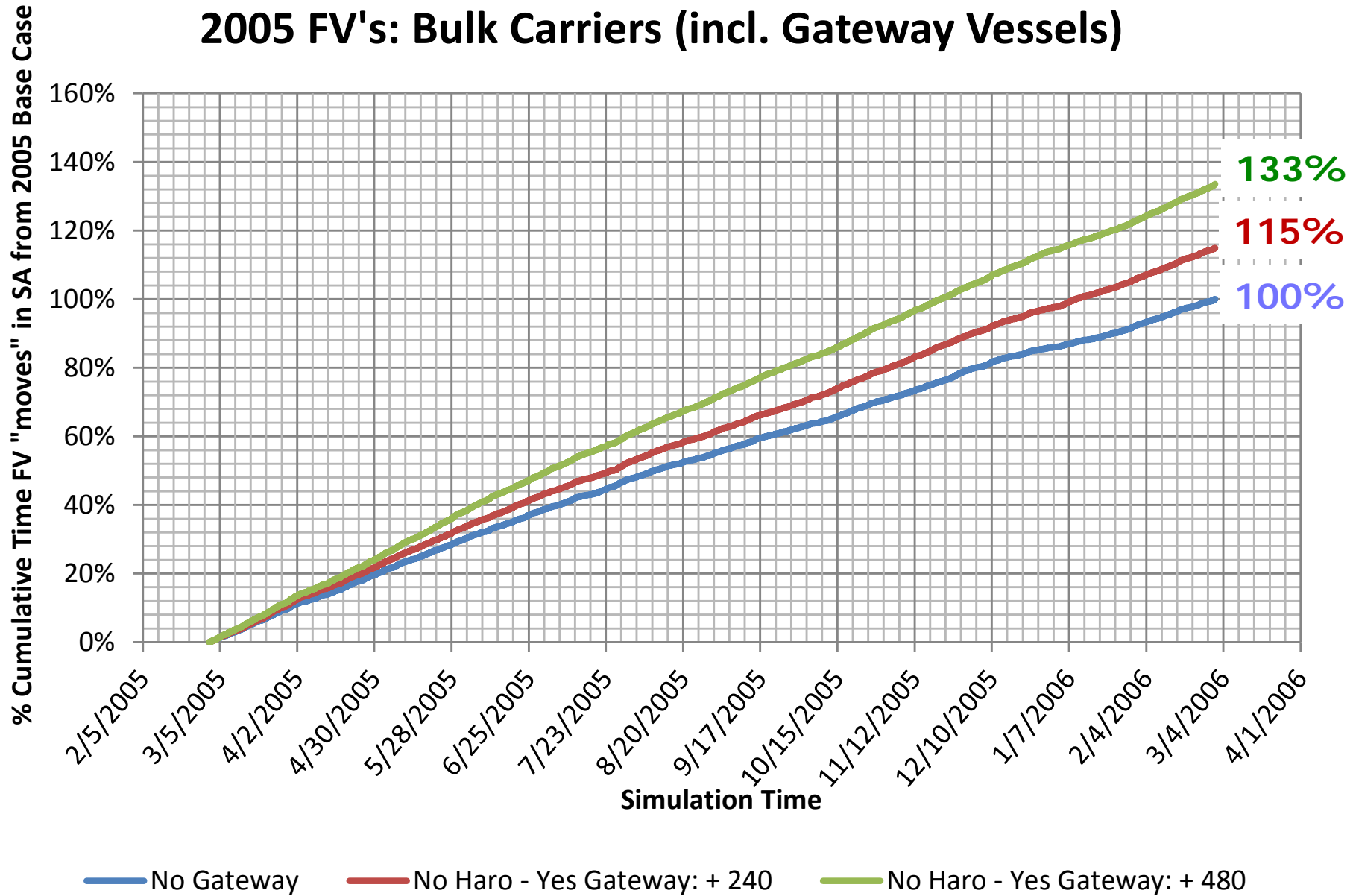
VCU

**FOCUS VESSELS: BULK CARRIERS
(Including Gateway Vessels)**

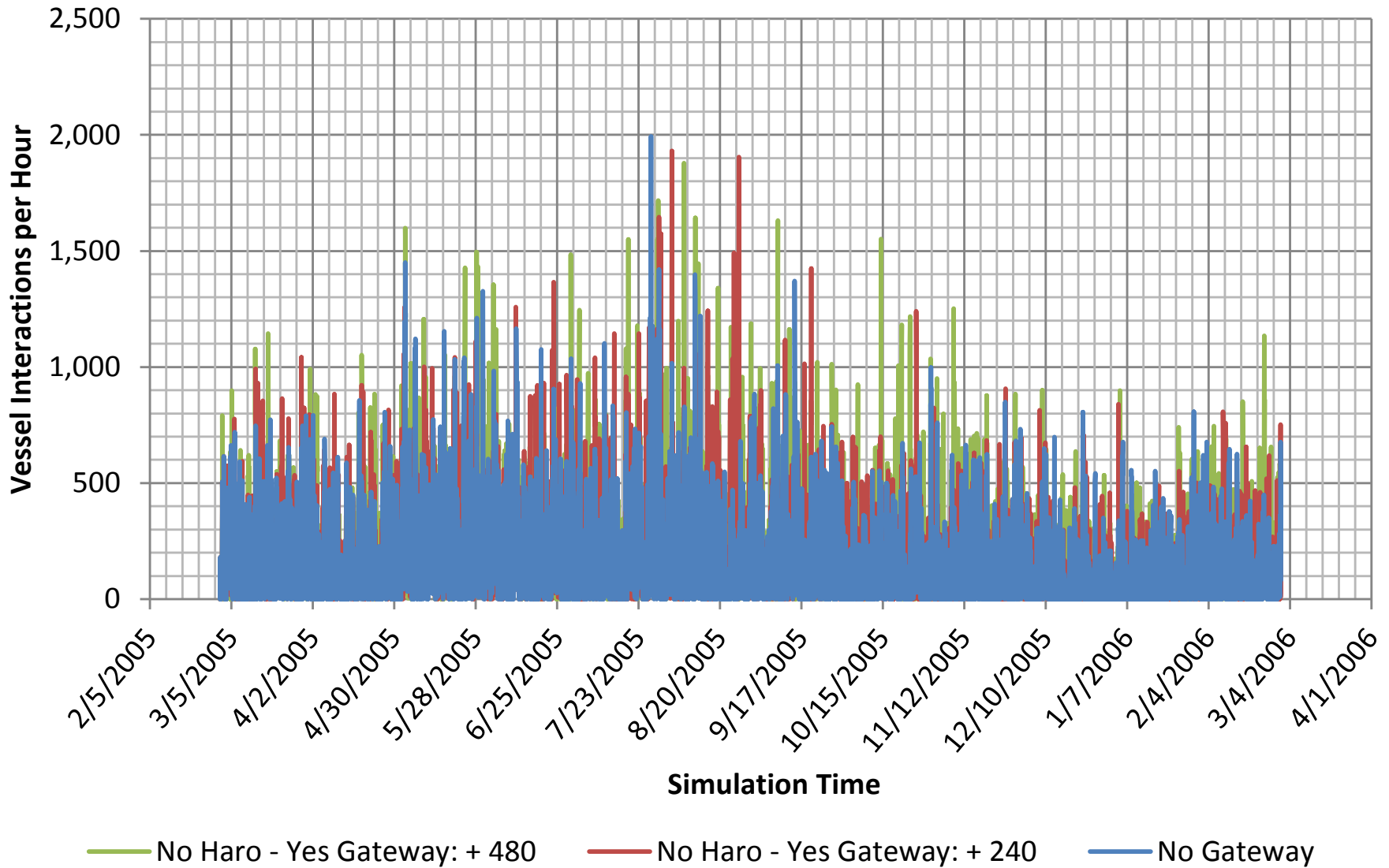
2005 FV's: Bulk Carriers (incl. Gateway Vessels)



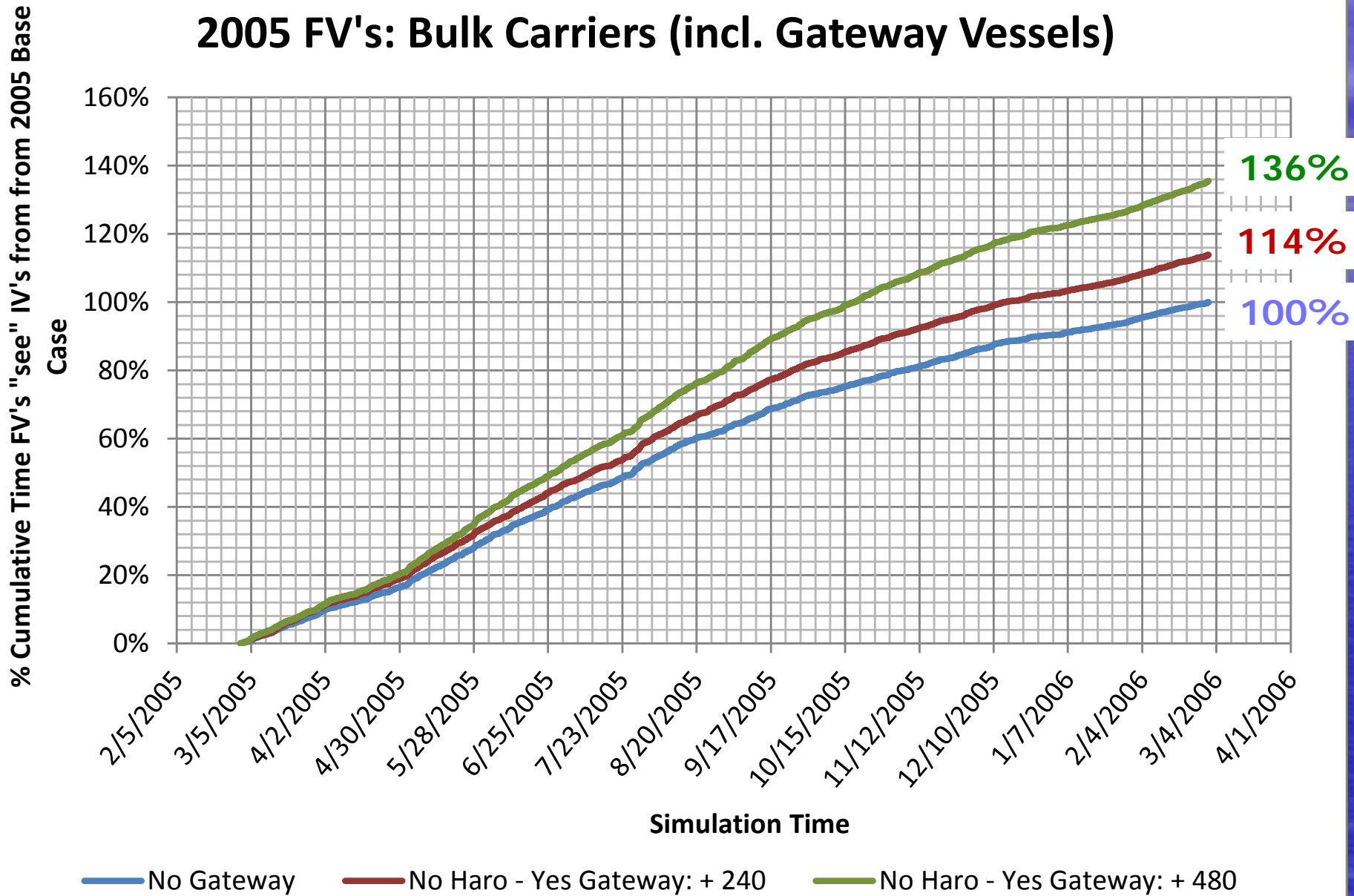
2005 FV's: Bulk Carriers (incl. Gateway Vessels)



2005 FV's: Bulk Carriers (incl. Gateway Vessels)

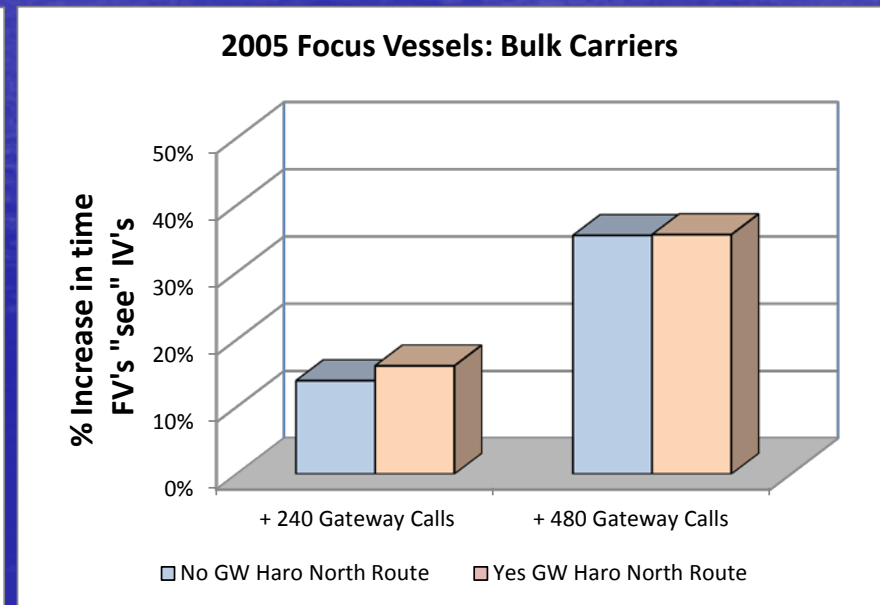
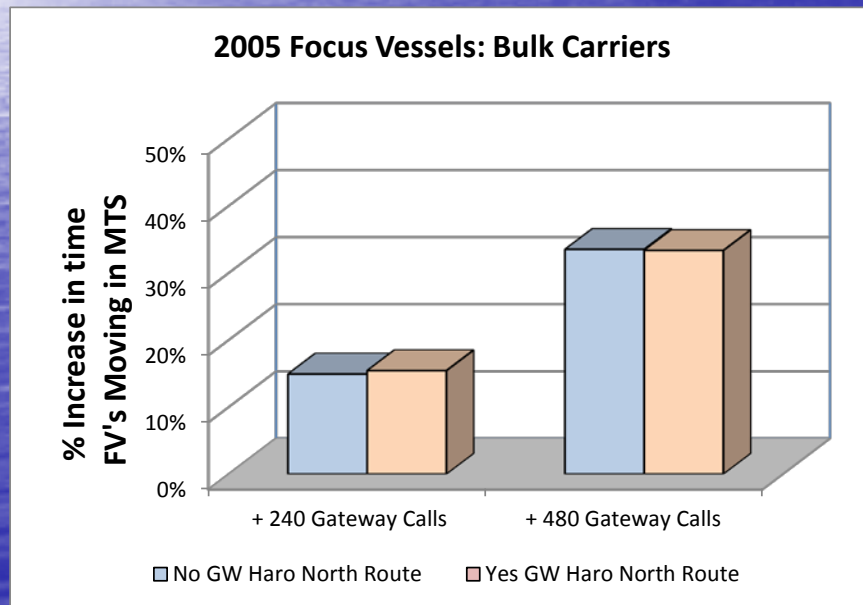


2005 FV's: Bulk Carriers (incl. Gateway Vessels)



2005 FOCUS VESSEL SCENARIO 1: BULK CARRIERS

Table A	A route interaction % change analysis of focus vessels and a vessel interaction % change analysis of focus vessels with other modeled traffic from base case in VTRA simulation model				
VTRA 2005	Base Case	Case 1	Case 2	Case 3	Case 4
Focus Vessels:	Base Case	Case 1	Case 2	Case 3	Case 4
Bulk Carrier	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls	N/A	≈ 240	≈ 240	≈ 480	≈ 480
Route Interactions	100.0%	114.9%	115.4%	133.5%	133.4%
Vessel Interactions	100.0%	113.9%	116.1%	135.5%	135.6%



Graph Explanation

32.0% of these FV to IV interactions in Base Case Occur in **Haro/Bound** in 2005

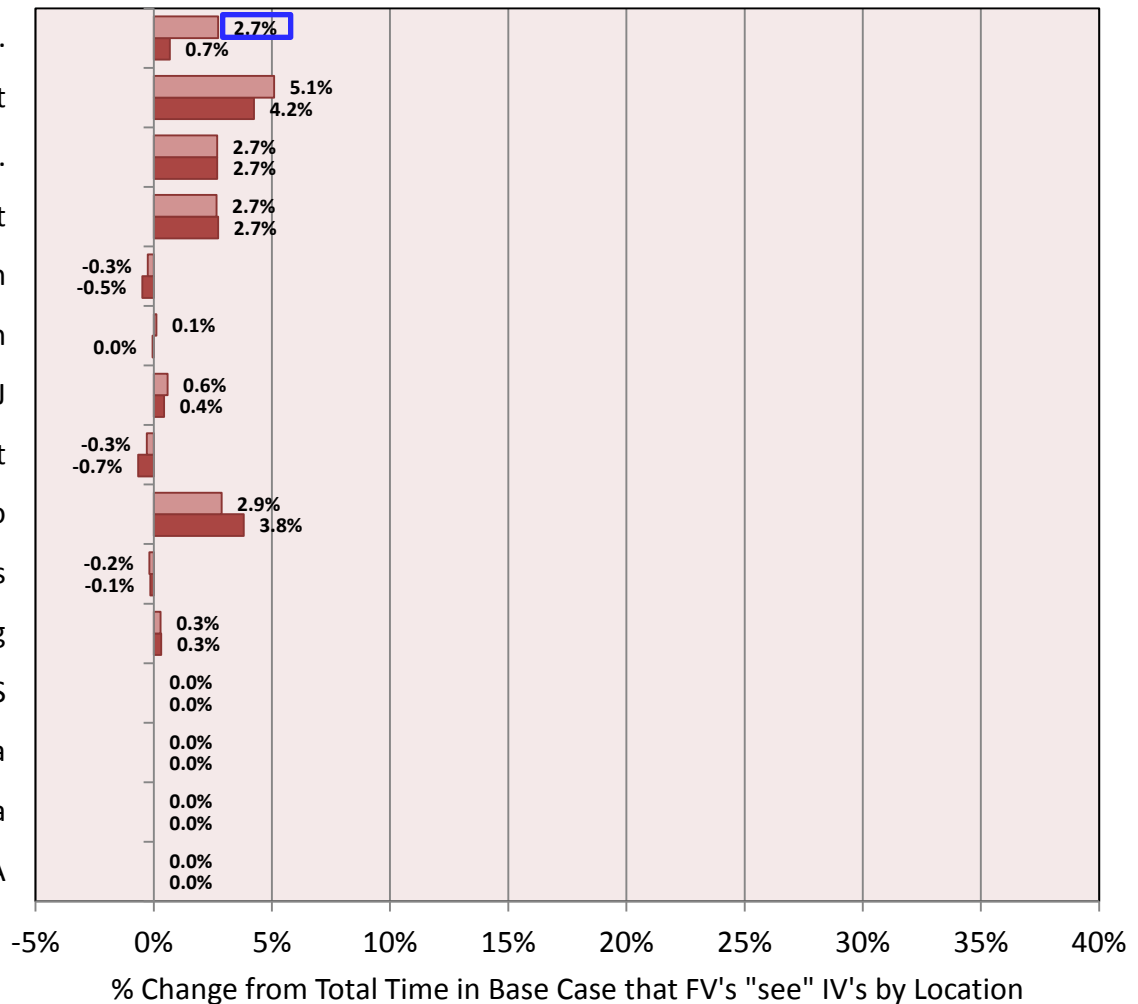
VTRA Case: + 240 GW with Haro North this increases to 32.0% + 2.7% = 34.7% of these FV to IV interactions in Base Case

100.0% of Total Time in Base Case that these FV's "see" these IV's

- (32.0%) - Haro/Bound.
- (22.8%) - SJF West
- (11.5%) - Georgia Str.
- (10.4%) - SJF East
- (8.2%) - PS North
- (6.9%) - PS South
- (6.4%) - Buoy J
- (0.7%) - Islids Trust
- (0.4%) - Rosario
- (0.4%) - Guemes
- (0.2%) - Saddle Bag
- (0.0%) - SJIS
- (0.0%) - Tacoma
- (0.0%) - Saratoga
- (0.0%) - ATBA

2005 VTRA Case: + 240 Gateway Calls

FV's: Bulk Carrier IV's: All Vessels



Yes GW Haro North Route

No GW Haro North Route

Graph Explanation

32.0% of these FV to IV interactions in Base Case Occur in **Haro/Bound** in 2005

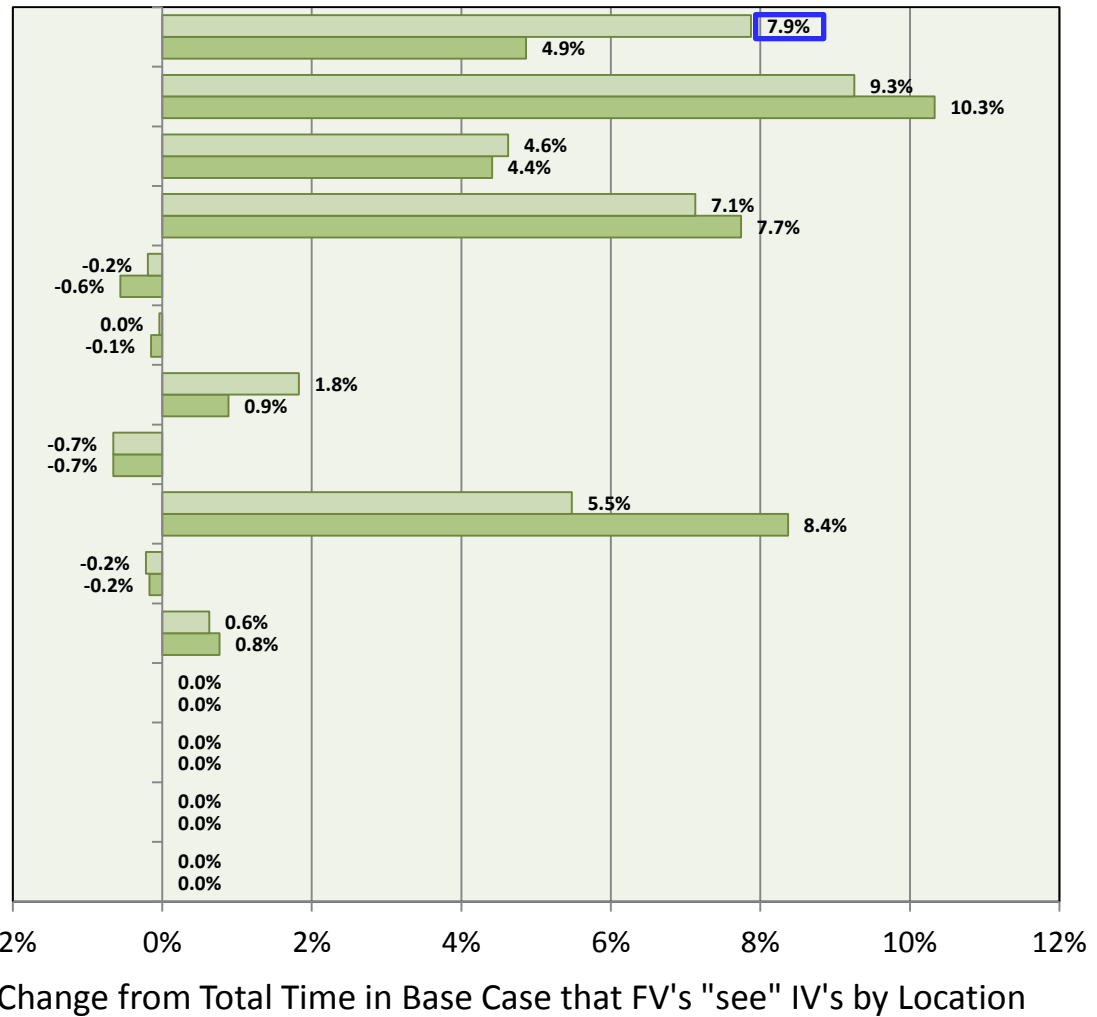
VTRA Case: + 480 GW with Haro North this increases to 32.0% + 7.9% = 39.9% of these FV to IV interactions in Base Case

100.0% of Total Time in Base Case that these FV's "see" these IV's

- (32.0%) - Haro/Bound.
- (22.8%) - SJF West
- (11.5%) - Georgia Str.
- (10.4%) - SJF East
- (8.2%) - PS North
- (6.9%) - PS South
- (6.4%) - Buoy J
- (0.7%) - Islids Trust
- (0.4%) - Rosario
- (0.4%) - Guemes
- (0.2%) - Saddle Bag
- (0.0%) - SJIS
- (0.0%) - Saratoga
- (0.0%) - Tacoma
- (0.0%) - ATBA

2005 VTRA Case: + 480 Gateway Calls

FV's: Bulk Carrier IV's: All Vessels



Yes GW Haro North Route No GW Haro North Route

FOCUS VESSELS (FV's): BULK CARRIERS IN VTRA 2005

Rank	% of Total Time that FV	Cumulative% of Total Time that FV	% Change from total time that FV "sees" an IV in Base Case			
	"sees" an IV in Base Case by Location	"sees" an IV in Base Case by Location	+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(32.0%) - Haro/Bound.	32.0%	0.7%	2.7%	4.9%	7.9%
2	(22.8%) - SJF West	54.9%	4.2%	5.1%	10.3%	9.3%
3	(11.5%) - Georgia Str.	66.3%	2.7%	2.7%	4.4%	4.6%
4	(10.4%) - SJF East	76.8%	2.7%	2.7%	7.7%	7.1%
5	(8.2%) - PS North	85.0%	-0.5%	-0.3%	-0.6%	-0.2%
6	(6.9%) - PS South	91.9%	0.0%	0.1%	-0.1%	0.0%
7	(6.4%) - Buoy J	98.3%	0.4%	0.6%	0.9%	1.8%
8	(0.7%) - Islas Trust	99.0%	-0.7%	-0.3%	-0.7%	-0.7%
9	(0.4%) - Rosario	99.4%	3.8%	2.9%	8.4%	5.5%
10	(0.4%) - Guemes	99.8%	-0.1%	-0.2%	-0.2%	-0.2%
11	(0.2%) - Saddle Bag	100.0%	0.3%	0.3%	0.8%	0.6%
12	(0.0%) - SJIS	100.0%	0.0%	0.0%	0.0%	0.0%
13	(0.0%) - Tacoma	100.0%	0.0%	0.0%	0.0%	0.0%
14	(0.0%) - Saratoga	100.0%	0.0%	0.0%	0.0%	0.0%
15	(0.0%) - ATBA	100.0%	0.0%	0.0%	0.0%	0.0%

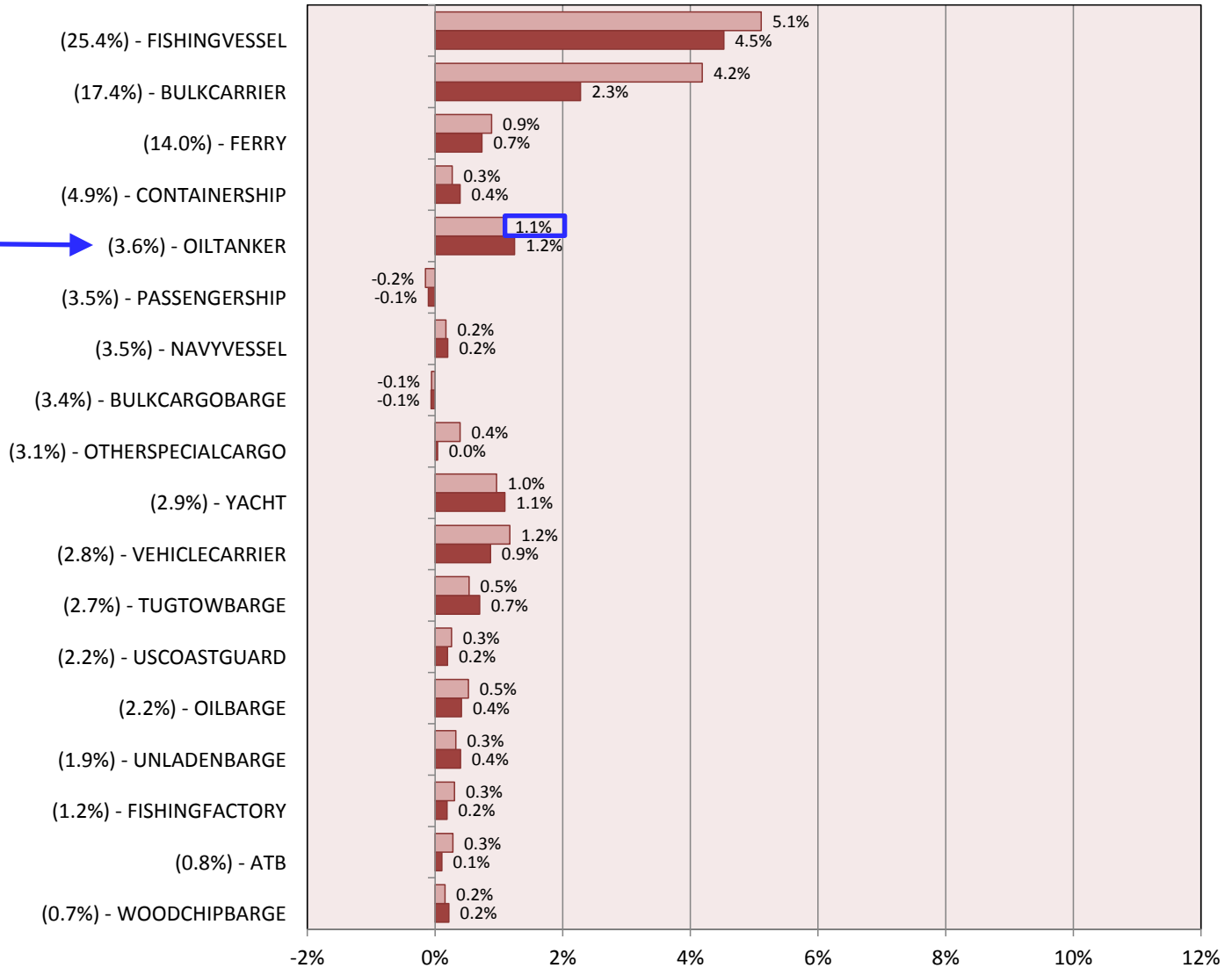
Graph Explanation

3.6% of these FV to IV interactions in Base Case Occur with Oil Tankers in 2005

VTRA Case: + 240 GW with Haro North this increases to 3.6% + 1.1% = 4.7% of these FV to IV interactions in Base Case

2005 VTRA Case: + 240 Gateway Calls Focus Vessels: Bulk Carrier

96.2% of Total Time in Base Case that these FV's "see" these IV's



% Change from Total Time in Base Case that these FV's "see" IV's by Vessel Type

Yes GW Haro North Route No GW Haro North Route

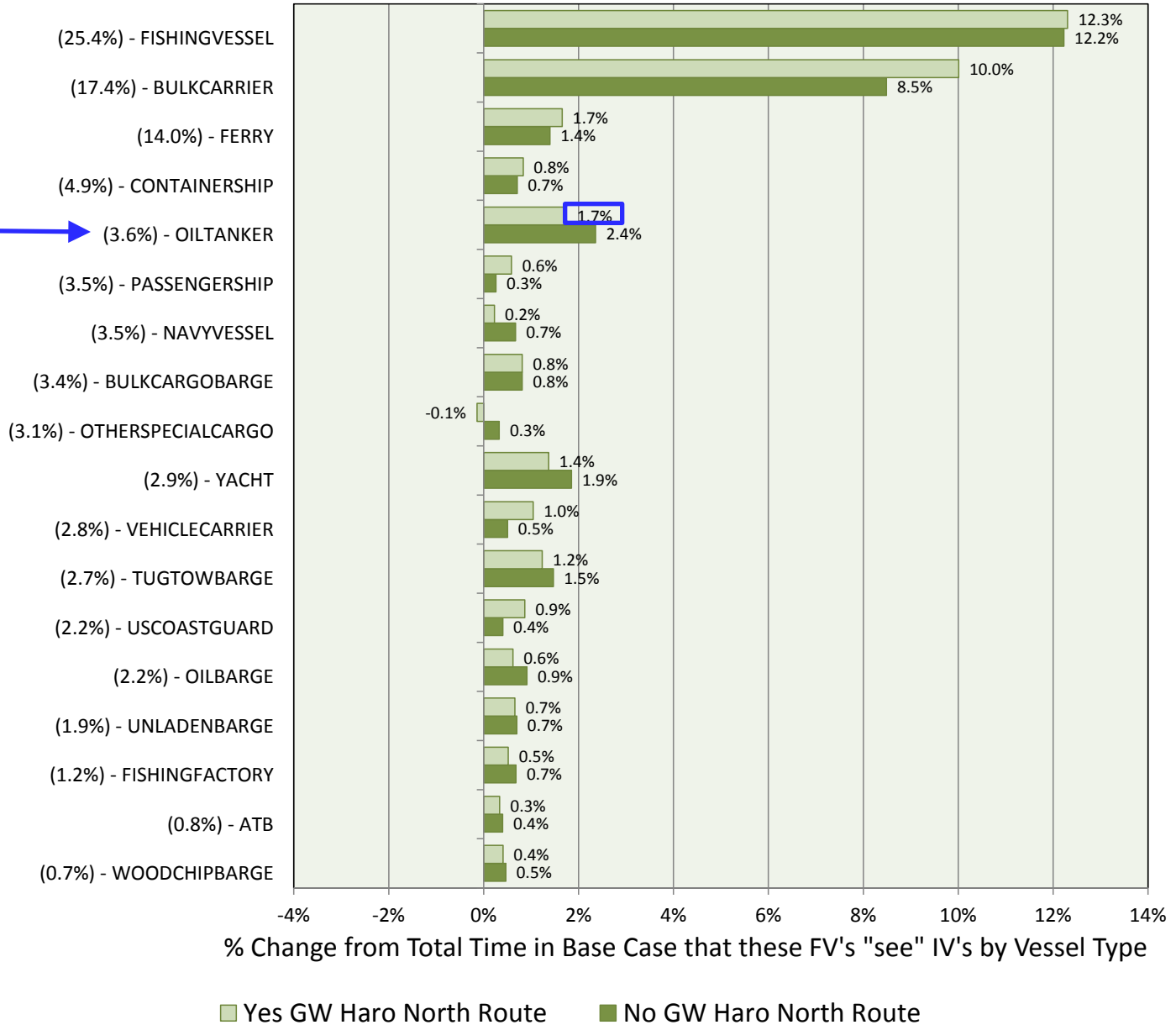
Graph Explanation

3.6% of these FV to IV interactions in Base Case Occur with Oil Tankers in 2005

VTRA Case: + 480 GW with Haro North this increases to 3.6% + 1.7% = 5.3% of these FV to IV interactions in Base Case

2005 VTRA Case: + 480 Gateway Calls Focus Vessels: Bulk Carrier

96.2% of Total Time in Base Case that these FV's "see" these IV's



Yes GW Haro North Route

No GW Haro North Route

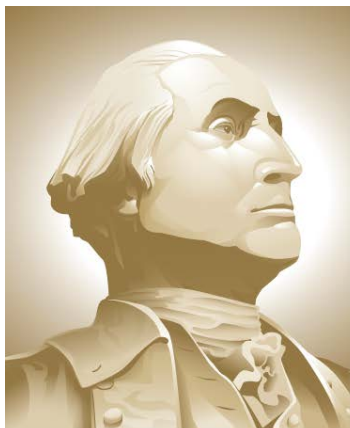
FOCUS VESSELS (FV's): BULK CARRIERS IN VTRA 2005

Rank	% of Total Time that FV	Cumulative% of Total Time that FV	% Change from total time that FV "sees" an IV in Base Case			
	"sees" an IV in Base Case by Vessel Type	"sees" an IV in Base Case by Vessel Type	+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(25.4%) - FISHINGVESSEL	25.4%	4.5%	5.1%	12.2%	12.3%
2	(17.4%) - BULKCARRIER	42.8%	2.3%	4.2%	8.5%	10.0%
3	(14.0%) - FERRY	56.8%	0.7%	0.9%	1.4%	1.7%
4	(4.9%) - CONTAINERSHIP	61.7%	0.4%	0.3%	0.7%	0.8%
5	(3.6%) - OILTANKER	65.3%	1.2%	1.1%	2.4%	1.7%
6	(3.5%) - PASSENGERSHIP	68.8%	-0.1%	-0.2%	0.3%	0.6%
7	(3.5%) - NAVYVESSEL	72.3%	0.2%	0.2%	0.7%	0.2%
8	(3.4%) - BULKCARGOBARGE	75.8%	-0.1%	-0.1%	0.8%	0.8%
9	(3.1%) - OTHERSPECIALCARGO	78.9%	0.0%	0.4%	0.3%	-0.1%
10	(2.9%) - YACHT	81.7%	1.1%	1.0%	1.9%	1.4%
11	(2.8%) - VEHICLECARRIER	84.5%	0.9%	1.2%	0.5%	1.0%
12	(2.7%) - TUGTOWBARGE	87.2%	0.7%	0.5%	1.5%	1.2%
13	(2.2%) - USCOASTGUARD	89.5%	0.2%	0.3%	0.4%	0.9%
14	(2.2%) - OILBARGE	91.7%	0.4%	0.5%	0.9%	0.6%
15	(1.9%) - UNLADENBARGE	93.5%	0.4%	0.3%	0.7%	0.7%
16	(1.2%) - FISHINGFACTORY	94.7%	0.2%	0.3%	0.7%	0.5%
17	(0.8%) - ATB	95.5%	0.1%	0.3%	0.4%	0.3%
18	(0.7%) - WOODCHIPBARGE	96.2%	0.2%	0.2%	0.5%	0.4%

VTRA PRELIMINARY GATEWAY ANALYSIS

A 2005 Exposure Analysis Comparison

Presentation by: J. Rene van Dorp



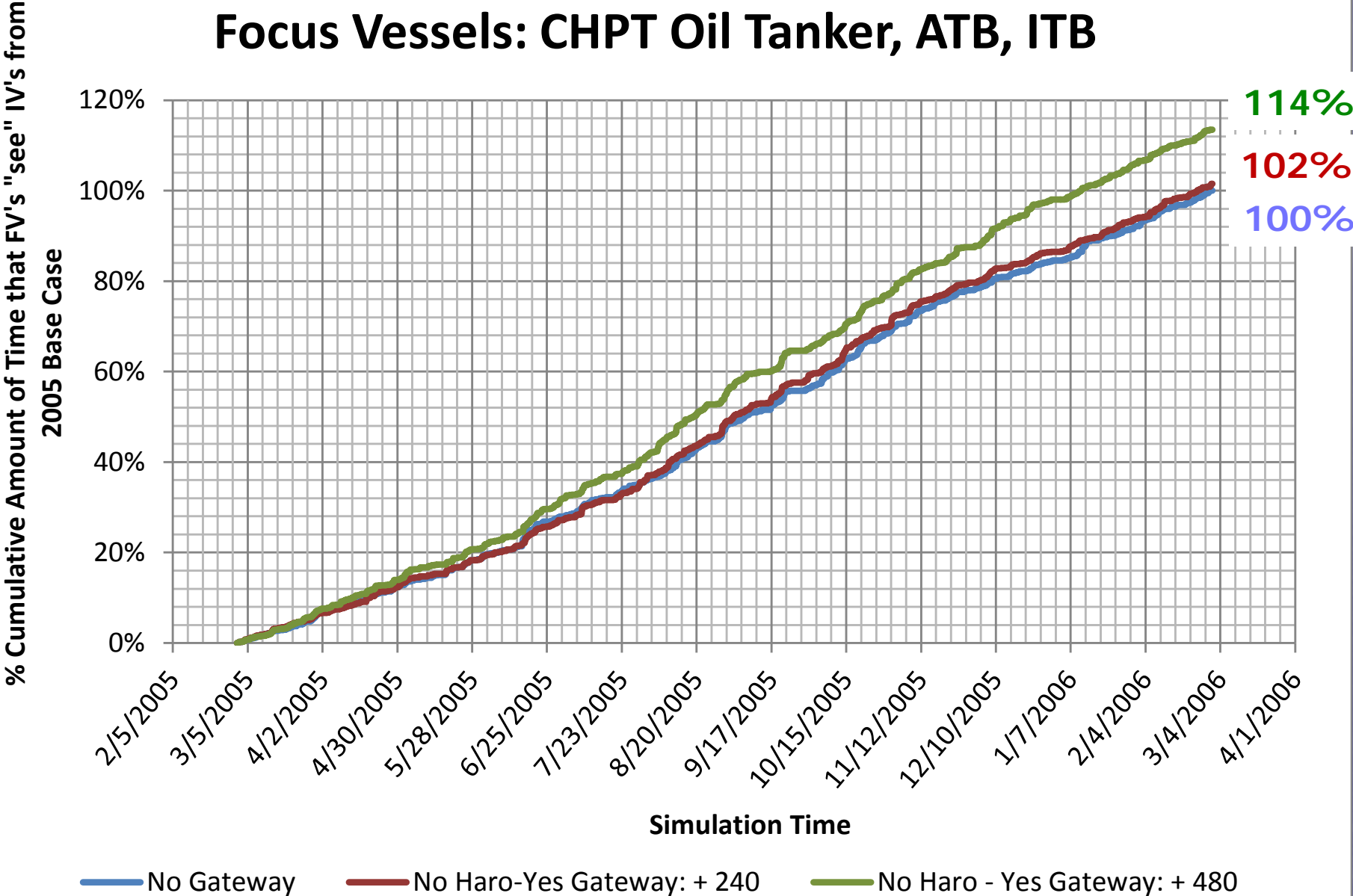
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WASHINGTON, DC

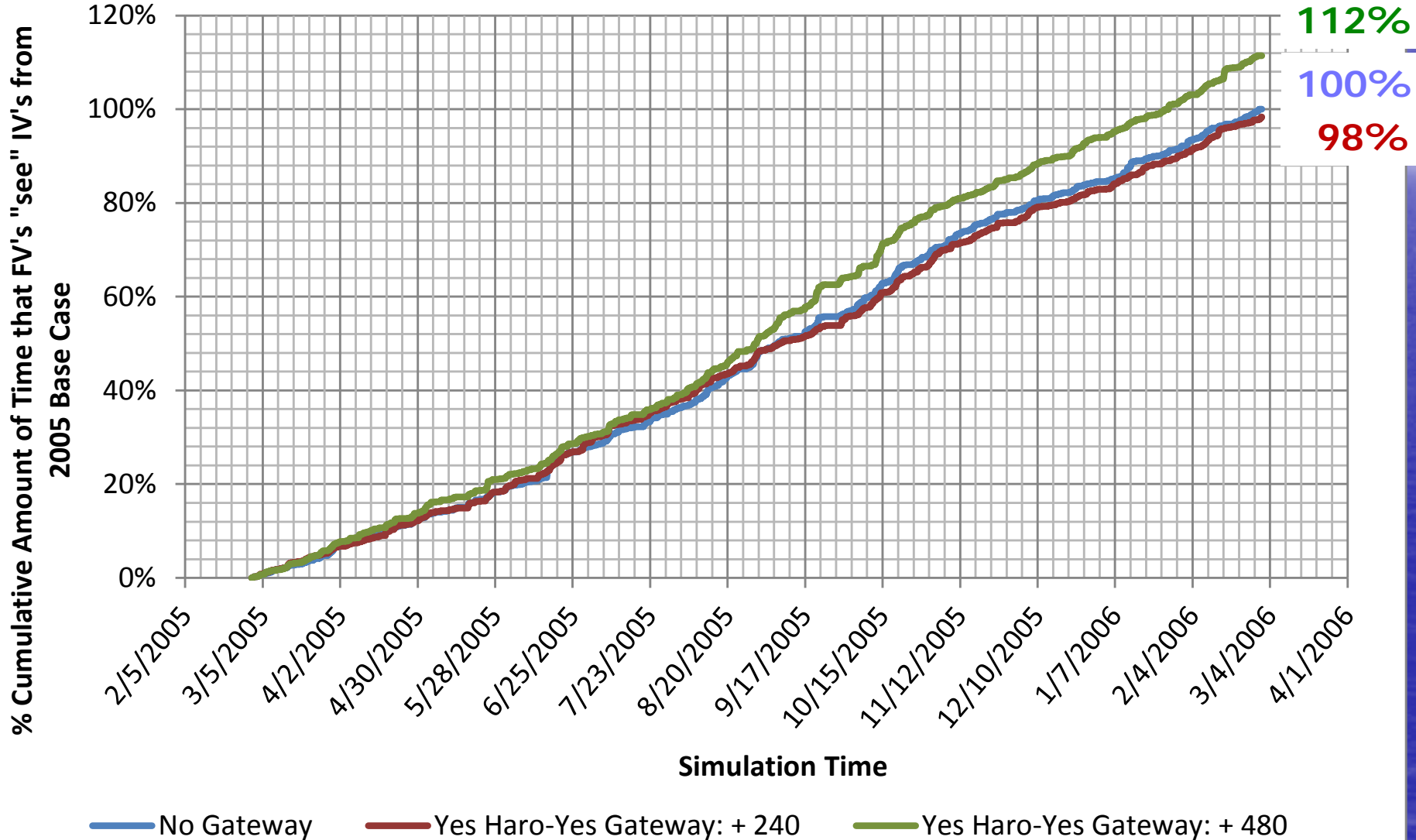
VCU

**FOCUS VESSELS: CHPT
Oil Tankers, ATB's and ITB's**

Focus Vessels: CHPT Oil Tanker, ATB, ITB

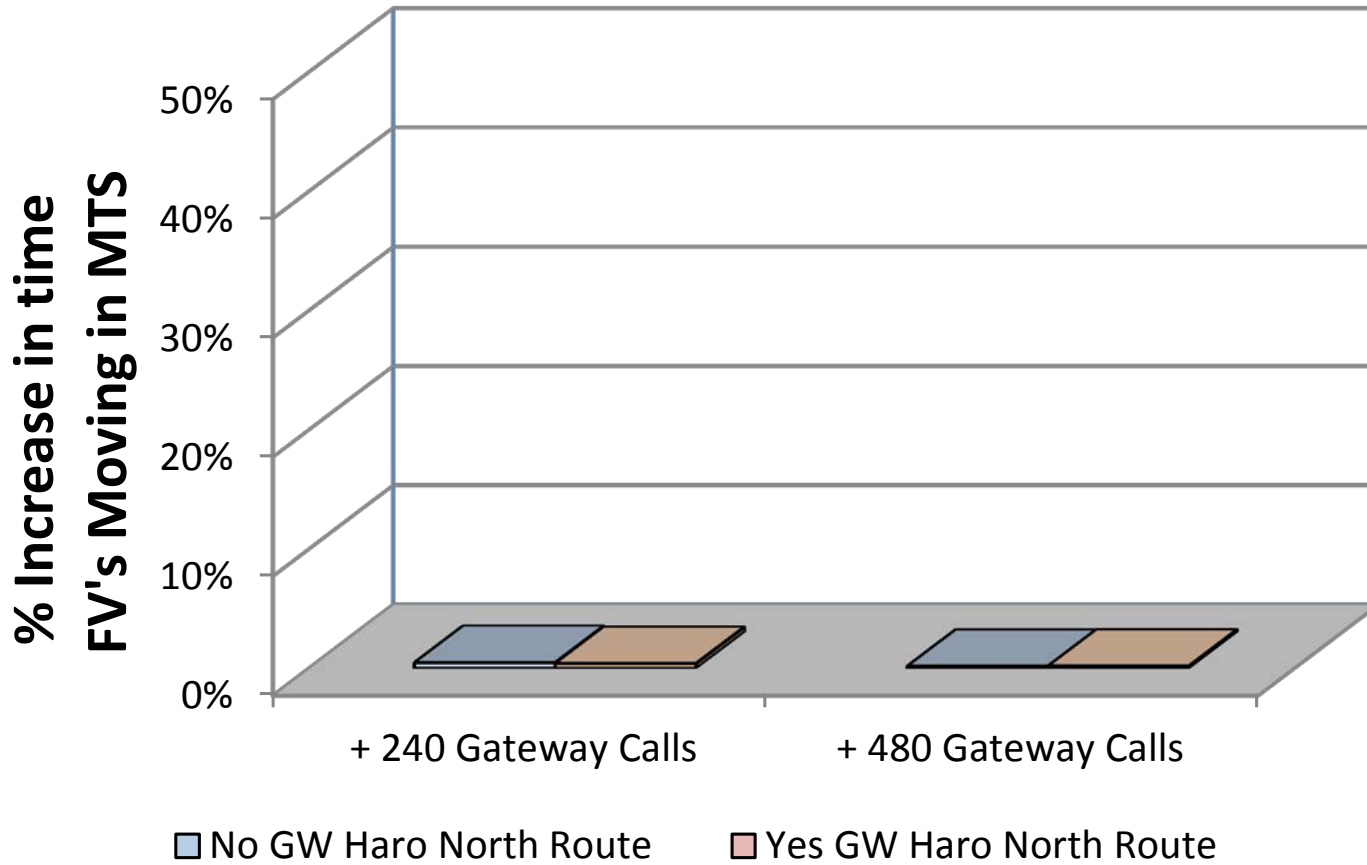


Focus Vessels: CHPT Oil Tanker, ATB, ITB



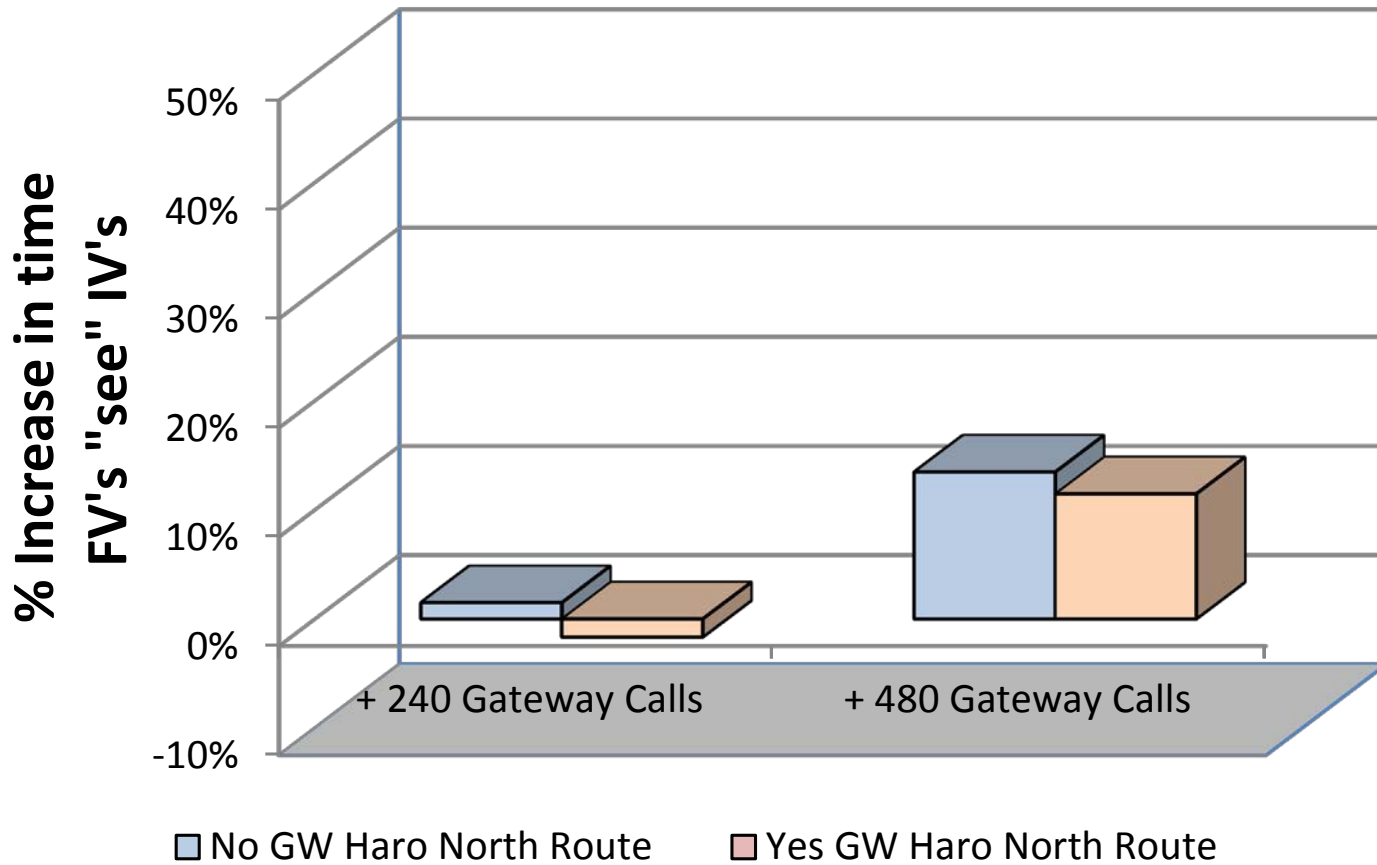
2005 FOCUS VESSEL SCENARIO 2: CHPT OIL TANKER, ATB, ITB

2005 Focus Vessels: CHPT Oil Tanker, ATB, ITB



2005 FOCUS VESSEL SCENARIO 2: CHPT OIL TANKER, ATB, ITB

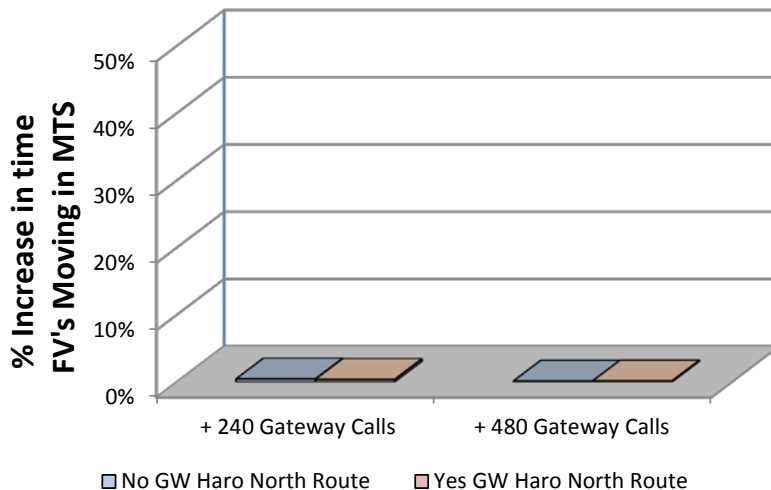
2005 Focus Vessels: CHPT Oil Tanker, ATB, ITB



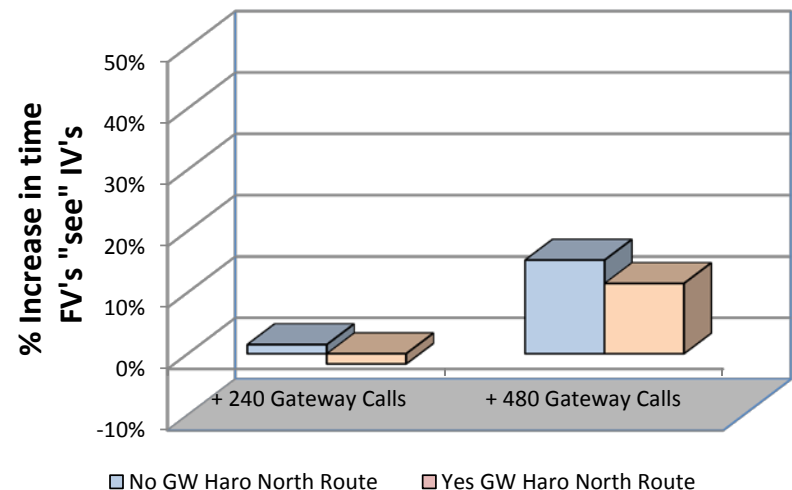
2005 VTRA DATA FOCUS VESSEL SCENARIO 3: CHPT OIL TANKERS, ATB's and ITB's

Table A VTRA 2005	A route interaction % change analysis of focus vessels and a vessel interaction % chance analysis of focus vessels with other modeled traffic from base case in VTRA simulation model				
Focus Vessels: CHPT Oil Tanker, ATB, ITB	Base Case	Case 1	Case 2	Case 3	Case 4
	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls	N/A	≈ 240	≈ 240	≈ 480	≈ 480
Route Interactions	100.0%	100.5%	100.4%	100.0%	100.2%
Vessel Interactions	100.0%	101.5%	98.3%	113.5%	111.5%

2005 Focus Vessels: CHPT Oil Tanker, ATB, ITB



2005 Focus Vessels: CHPT Oil Tanker, ATB, ITB



Graph Explanation

27.6% of these FV to IV interactions in Base Case Occur in **Rosario** in 2005

VTRA Case: + 240 GW with Haro North this decreases to 27.6% - 3.8% = 23.8% of these FV to IV interactions in Base Case

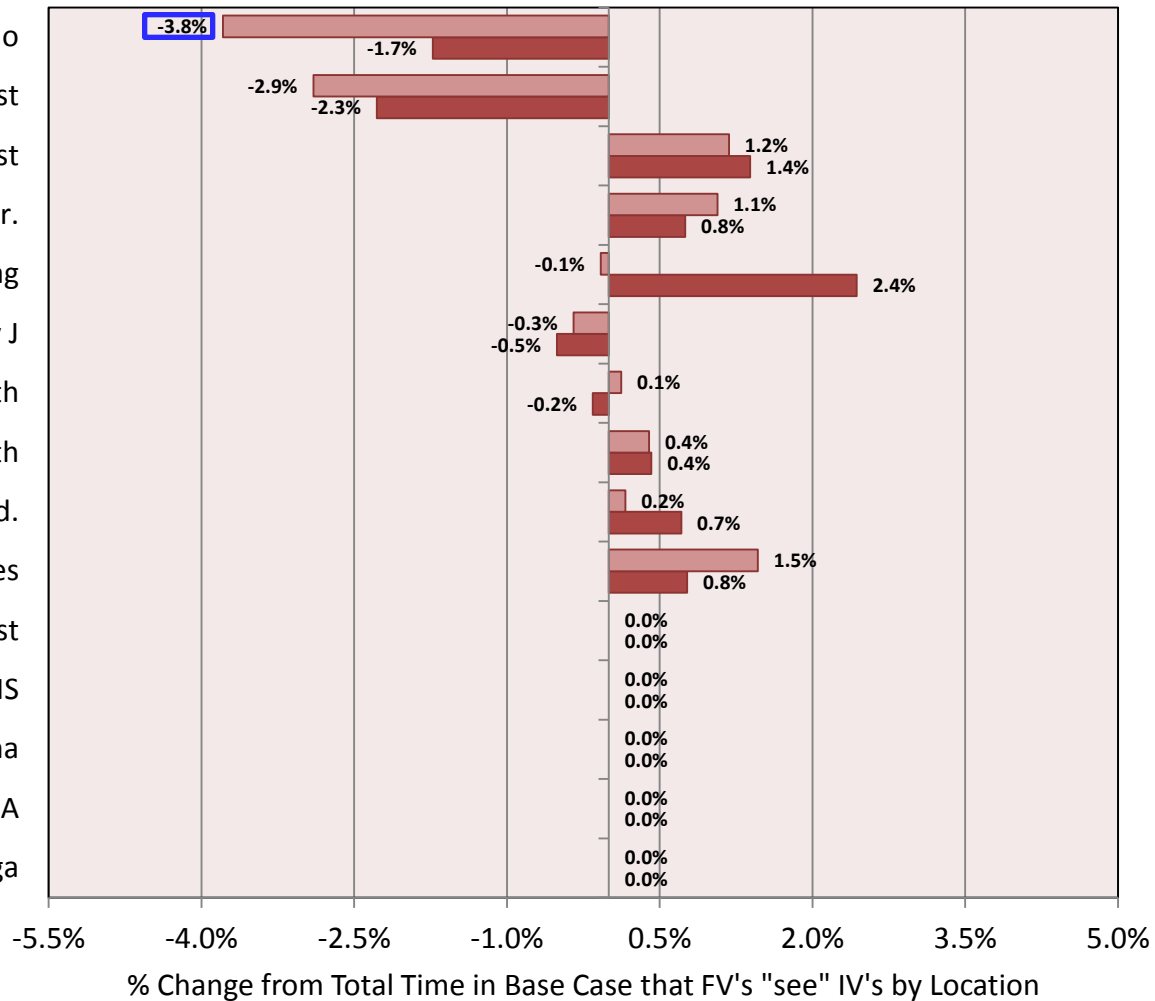
100.0% of Total Time in Base Case that these FV's "see" these IV's

(27.6%) - Rosario
 (20.9%) - SJF West
 (17.8%) - SJF East
 (13.1%) - Georgia Str.
 (6.1%) - Saddle Bag
 (5.6%) - Buoy J
 (3.1%) - PS North
 (2.3%) - PS South
 (1.9%) - Haro/Bound.
 (1.7%) - Guemes
 (0.0%) - Islas Trust
 (0.0%) - SJIS
 (0.0%) - Tacoma
 (0.0%) - ATBA
 (0.0%) - Saratoga

2005 VTRA Case: + 240 Gateway Calls

FV's: CHPT Oil Tanker, ATB, ITB

IV's: All Vessels



■ Yes GW Haro North Route

■ No GW Haro North Route

Graph Explanation

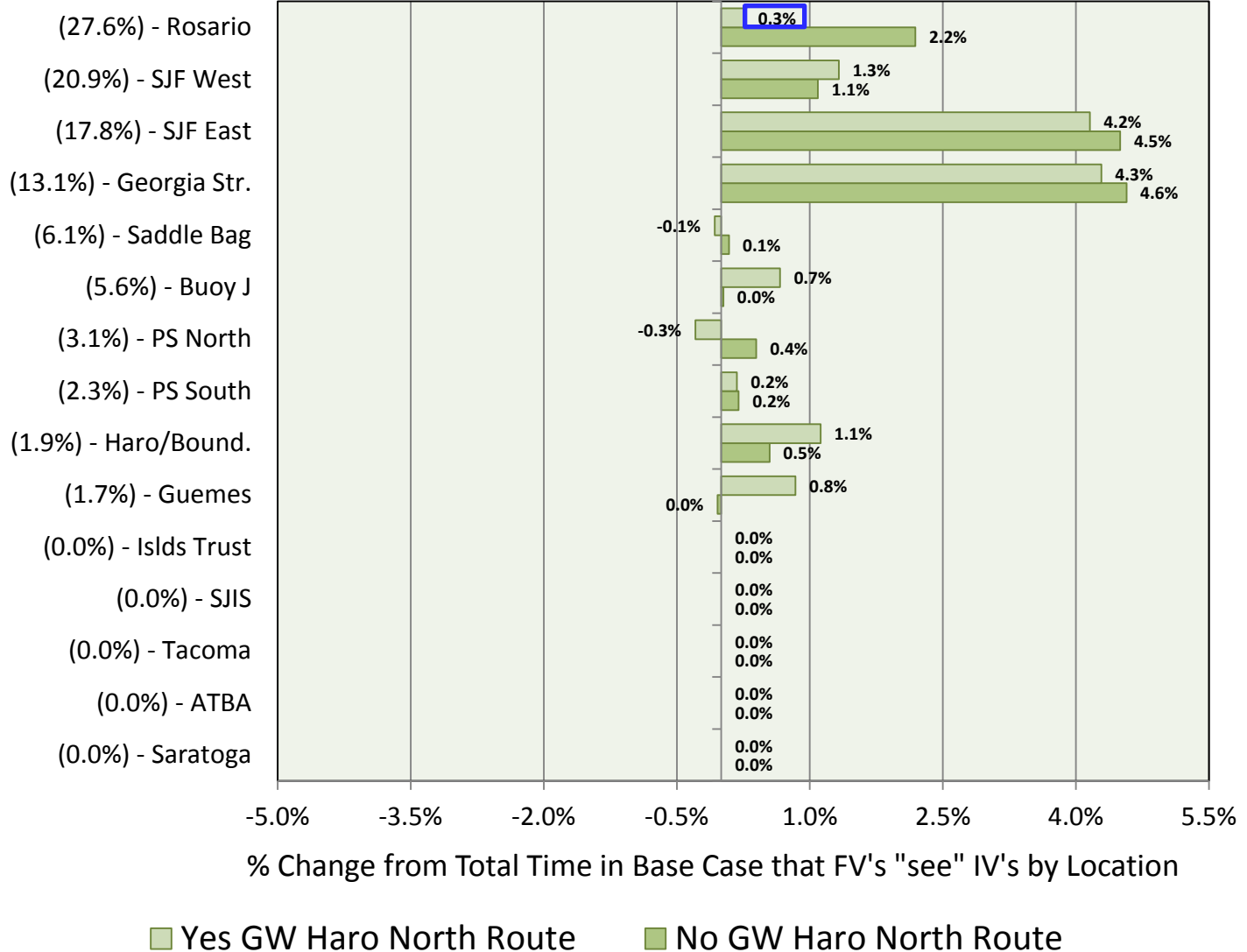
27.6% of these FV to IV interactions in Base Case Occur in **Rosario** in 2005

VTRA Case: + 480 GW with Haro North this increases to 27.6% + 0.3% = 27.9% of these FV to IV interactions in Base Case

100.0% of Total Time in Base Case that these FV's "see" these IV's

2005 VTRA Case: + 480 Gateway Calls

FV's: CHPT Oil Tanker, ATB, ITB IV's: All Vessels



FOCUS VESSELS (FV's): CHPT OIL TANKER, ATB, ITB IN VTRA 2005

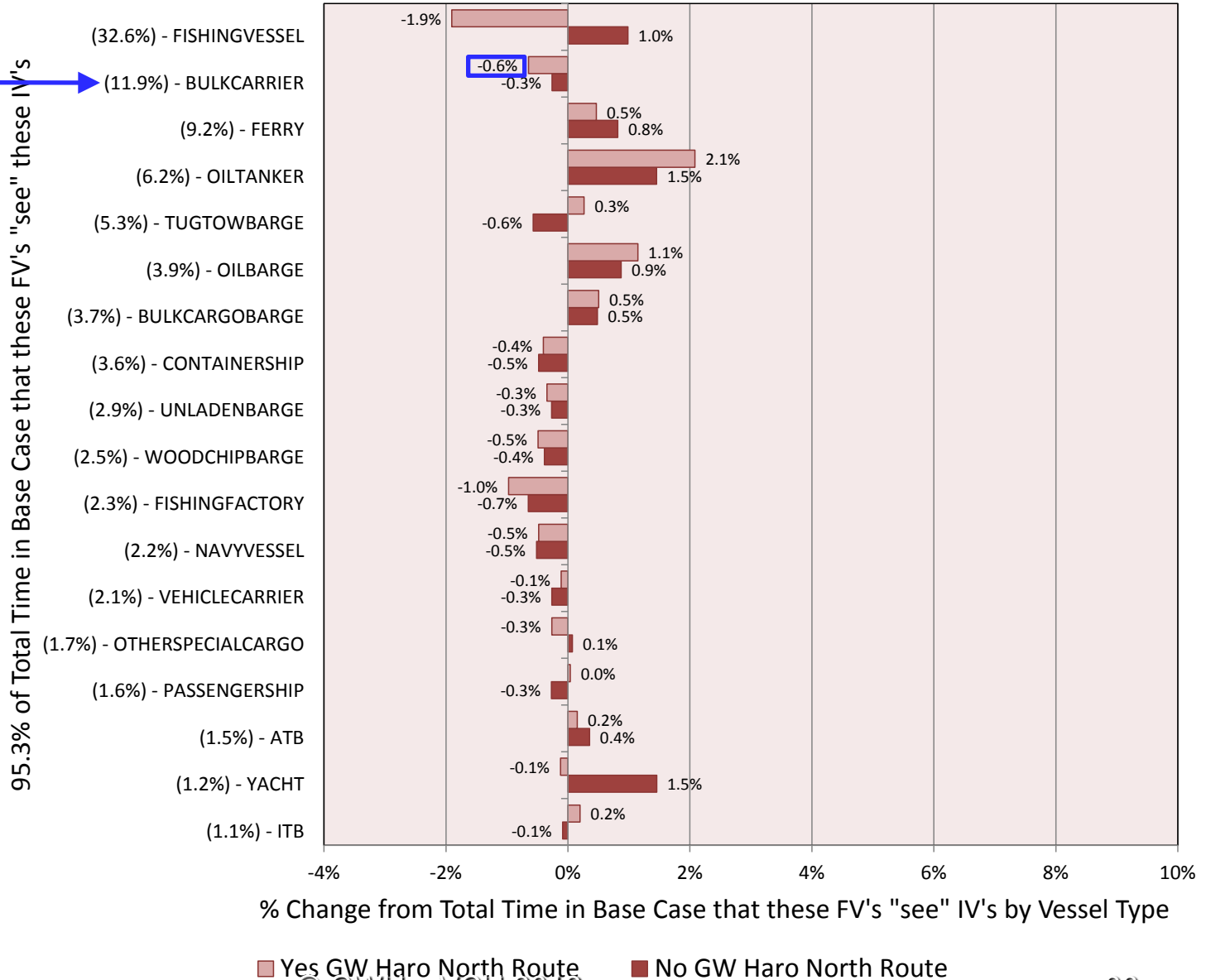
Rank	% of Total Time that FV	Cumulative% of Total Time that FV	% Change from total time that FV "sees" an IV in Base Case			
	"sees" an IV in Base Case by Location	"sees" an IV in Base Case by Location	+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(27.6%) - Rosario	27.6%	-1.7%	-3.8%	2.2%	0.3%
2	(20.9%) - SJF West	48.5%	-2.3%	-2.9%	1.1%	1.3%
3	(17.8%) - SJF East	66.3%	1.4%	1.2%	4.5%	4.2%
4	(13.1%) - Georgia Str.	79.4%	0.8%	1.1%	4.6%	4.3%
5	(6.1%) - Saddle Bag	85.5%	2.4%	-0.1%	0.1%	-0.1%
6	(5.6%) - Buoy J	91.1%	-0.5%	-0.3%	0.0%	0.7%
7	(3.1%) - PS North	94.1%	-0.2%	0.1%	0.4%	-0.3%
8	(2.3%) - PS South	96.4%	0.4%	0.4%	0.2%	0.2%
9	(1.9%) - Haro/Bound.	98.3%	0.7%	0.2%	0.5%	1.1%
10	(1.7%) - Guemes	100.0%	0.8%	1.5%	0.0%	0.8%
11	(0.0%) - Islds Trust	100.0%	0.0%	0.0%	0.0%	0.0%
12	(0.0%) - SJIS	100.0%	0.0%	0.0%	0.0%	0.0%
13	(0.0%) - Tacoma	100.0%	0.0%	0.0%	0.0%	0.0%
14	(0.0%) - ATBA	100.0%	0.0%	0.0%	0.0%	0.0%
15	(0.0%) - Saratoga	100.0%	0.0%	0.0%	0.0%	0.0%

Graph Explanation

11.9% of these FV to IV interactions in Base Case Occur with Bulk Carriers in 2005

VTRA Case: + 240 GW with Haro North this decreases to 11.9% - 0.6% = 11.3% of these FV to IV interactions in Base Case

2005 VTRA Case: + 240 Gateway Calls Focus Vessels: CHPT Oil Tanker, ATB, ITB

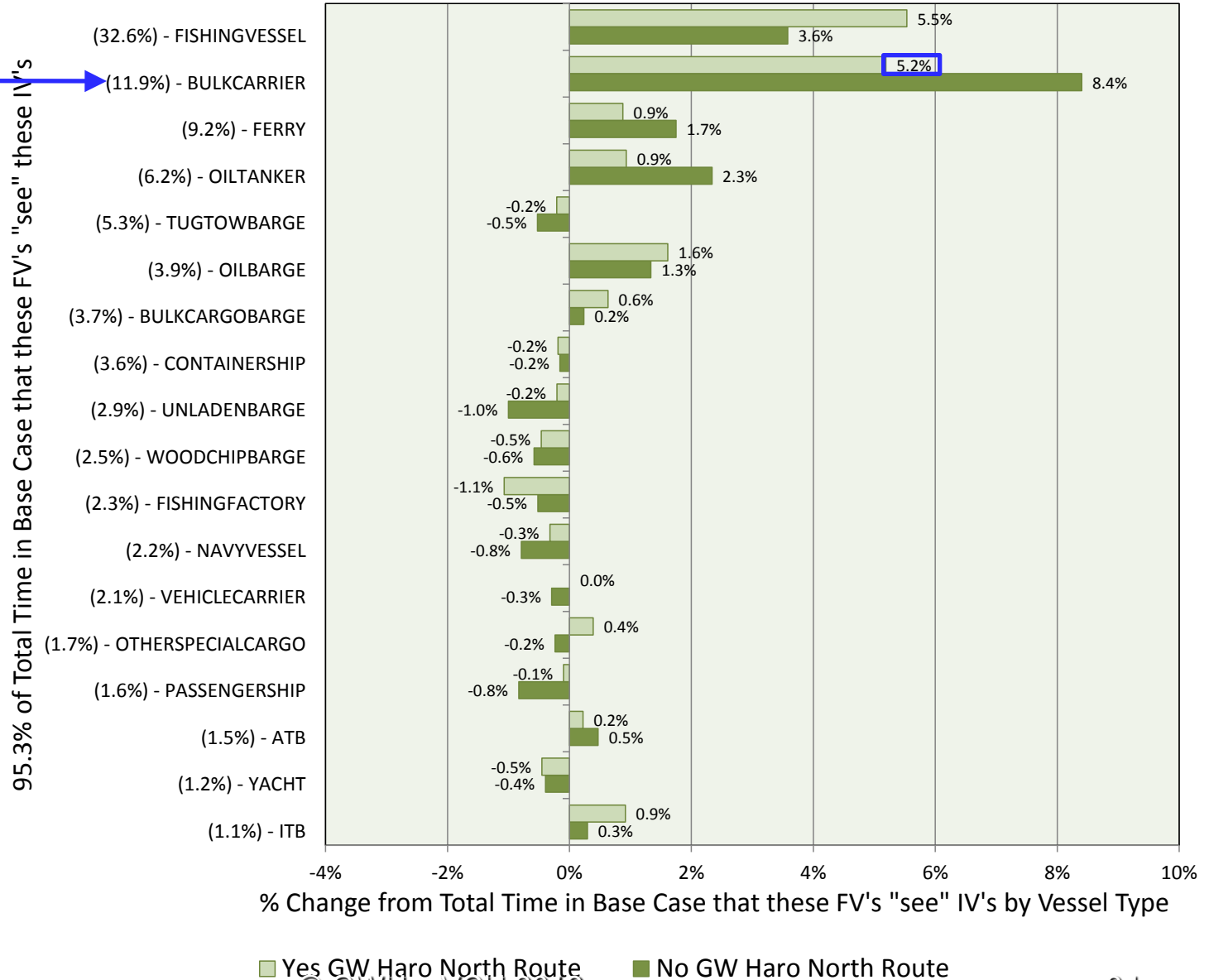


Graph Explanation

11.9% of these FV to IV interactions in Base Case Occur with Bulk Carriers in 2005

VTRA Case: + 480 GW with Haro North this increases to 11.9% + 5.2% = 17.1% of these FV to IV interactions in Base Case

2005 VTRA Case: + 480 Gateway Calls Focus Vessels: CHPT Oil Tanker, ATB, ITB



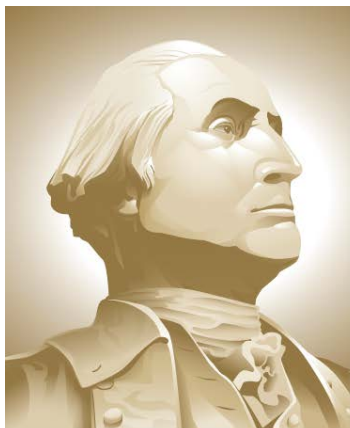
FOCUS VESSELS (FV's): CHPT OI TANKER, ATB, ITB IN VTRA 2005

Rank	% of Total Time that FV "sees" an IV in Base Case by Vessel Type	Cumulative% of Total Time that FV "sees" an IV in Base Case by Vessel Type	% Change from total time that FV "sees" an IV in Base Case			
			+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(32.6%) - FISHINGVESSEL	32.6%	1.0%	-1.9%	3.6%	5.5%
2	(11.9%) - BULKCARRIER	44.5%	-0.3%	-0.6%	8.4%	5.2%
3	(9.2%) - FERRY	53.7%	0.8%	0.5%	1.7%	0.9%
4	(6.2%) - OILTANKER	59.9%	1.5%	2.1%	2.3%	0.9%
5	(5.3%) - TUGTOWBARGE	65.2%	-0.6%	0.3%	-0.5%	-0.2%
6	(3.9%) - OILBARGE	69.0%	0.9%	1.1%	1.3%	1.6%
7	(3.7%) - BULKCARGOBARGE	72.8%	0.5%	0.5%	0.2%	0.6%
8	(3.6%) - CONTAINERSHIP	76.3%	-0.5%	-0.4%	-0.2%	-0.2%
9	(2.9%) - UNLADENBARGE	79.2%	-0.3%	-0.3%	-1.0%	-0.2%
10	(2.5%) - WOODCHIPBARGE	81.8%	-0.4%	-0.5%	-0.6%	-0.5%
11	(2.3%) - FISHINGFACTORY	84.0%	-0.7%	-1.0%	-0.5%	-1.1%
12	(2.2%) - NAVYVESSEL	86.2%	-0.5%	-0.5%	-0.8%	-0.3%
13	(2.1%) - VEHICLECARRIER	88.3%	-0.3%	-0.1%	-0.3%	0.0%
14	(1.7%) - OTHERSPECIALCARGO	90.0%	0.1%	-0.3%	-0.2%	0.4%
15	(1.6%) - PASSENGERSHIP	91.6%	-0.3%	0.0%	-0.8%	-0.1%
16	(1.5%) - ATB	93.1%	0.4%	0.2%	0.5%	0.2%
17	(1.2%) - YACHT	94.3%	1.5%	-0.1%	-0.4%	-0.5%
18	(1.1%) - ITB	95.3%	-0.1%	0.2%	0.3%	0.9%

VTRA PRELIMINARY GATEWAY ANALYSIS

A 2005 Exposure Analysis Comparison

Presentation by: J. Rene van Dorp



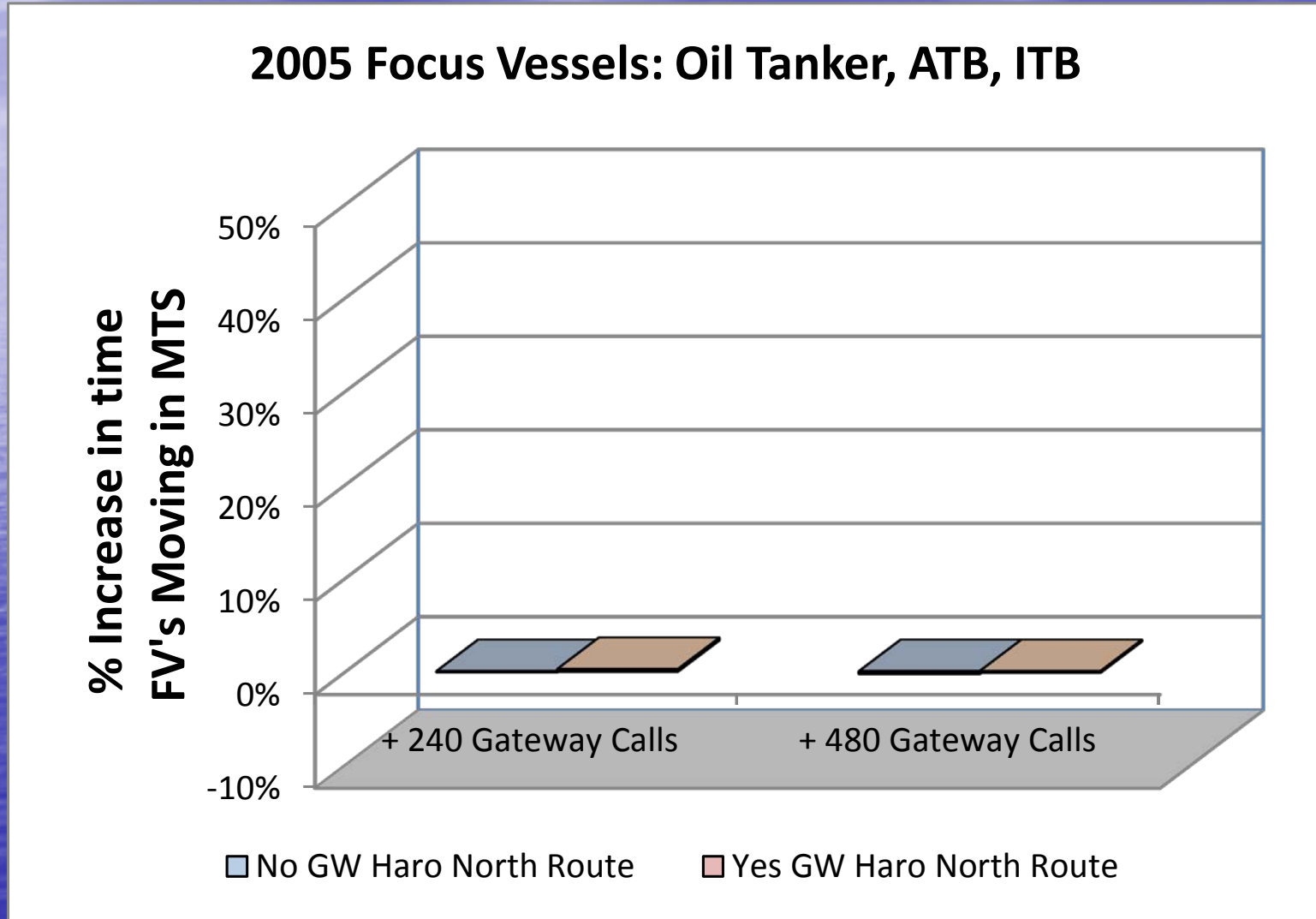
**THE GEORGE
WASHINGTON
UNIVERSITY**

WASHINGTON, DC

VCU

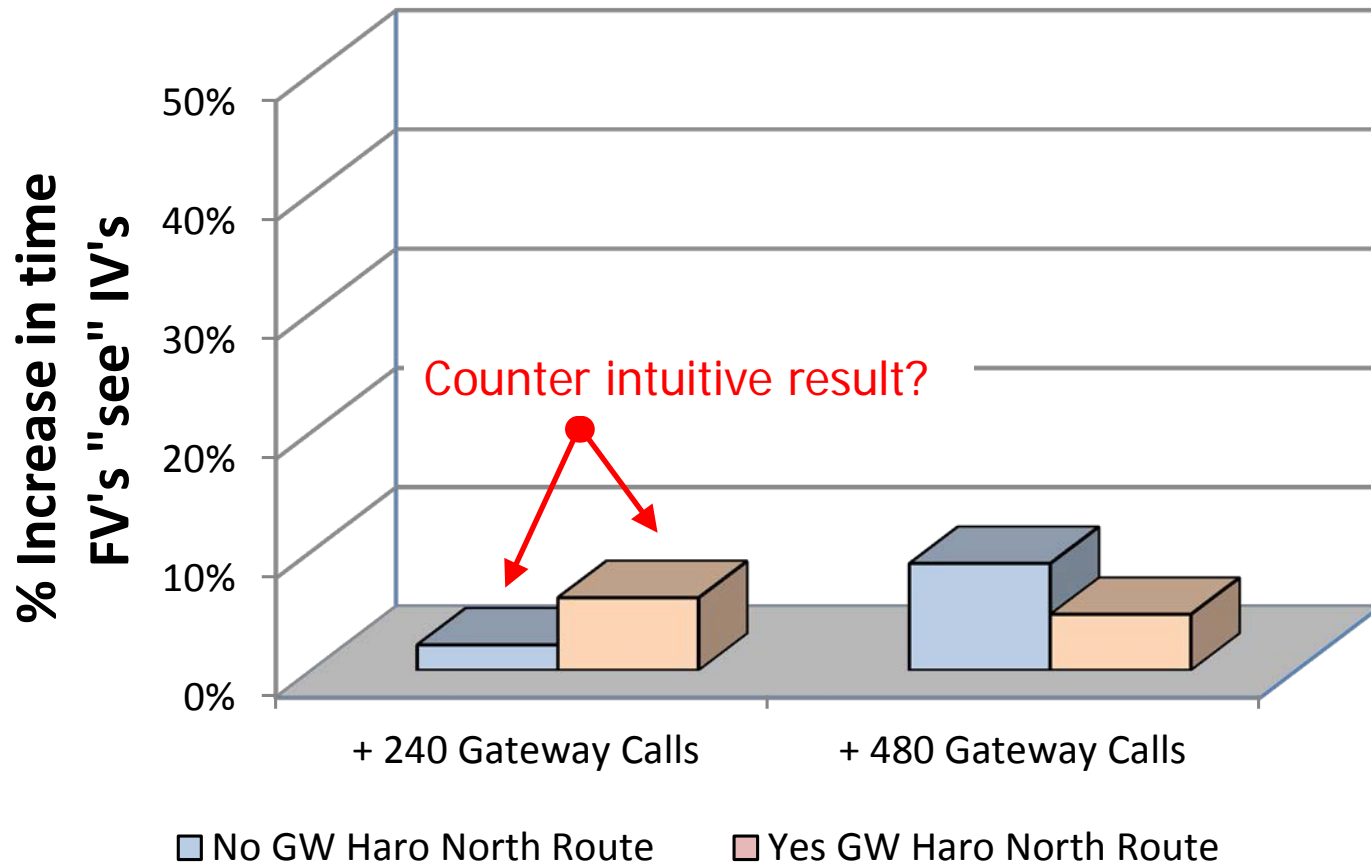
**FOCUS VESSELS: All
Oil Tankers, ATB's and ITB's**

2005 FOCUS VESSEL SCENARIO 3: OIL TANKER, ATB, ITB

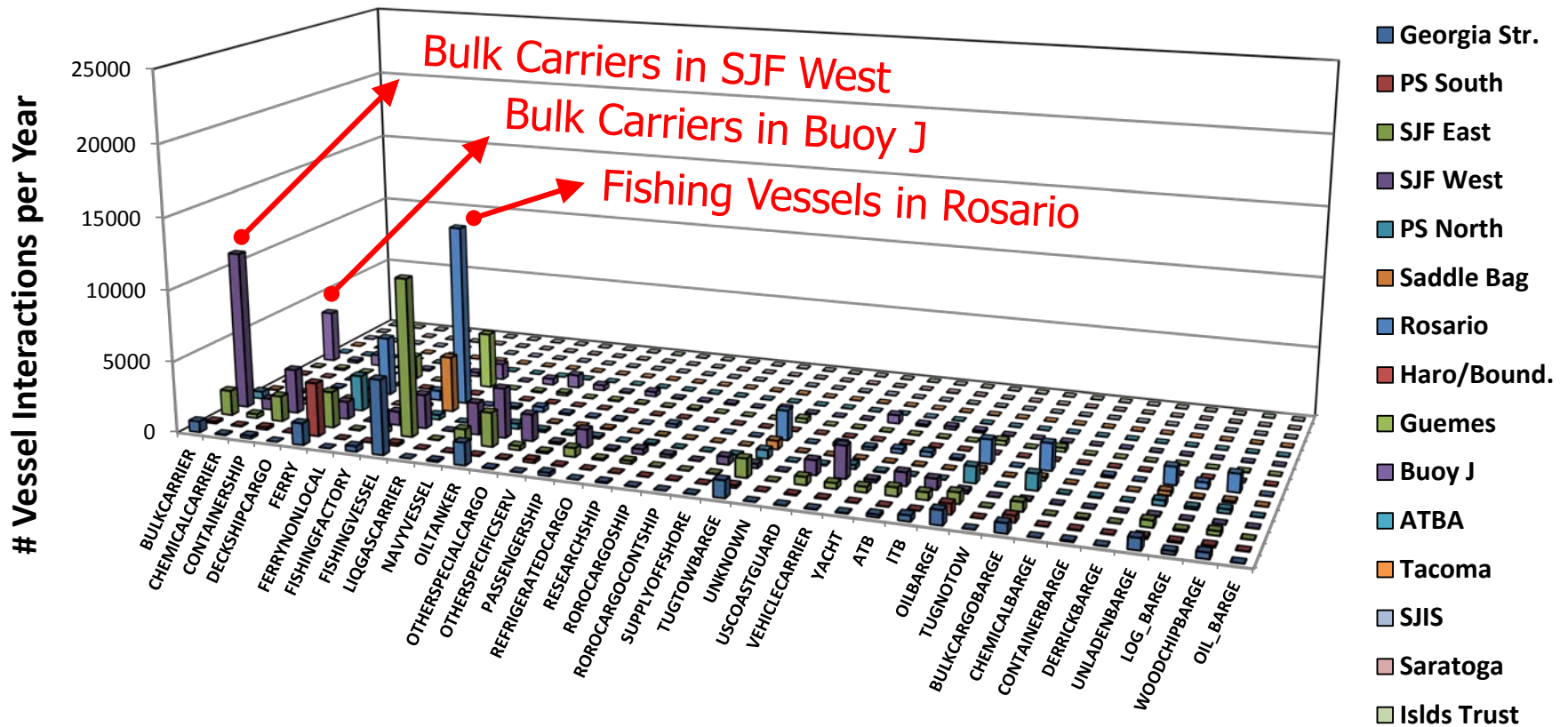


2005 FOCUS VESSEL SCENARIO 3: OIL TANKER, ATB, ITB

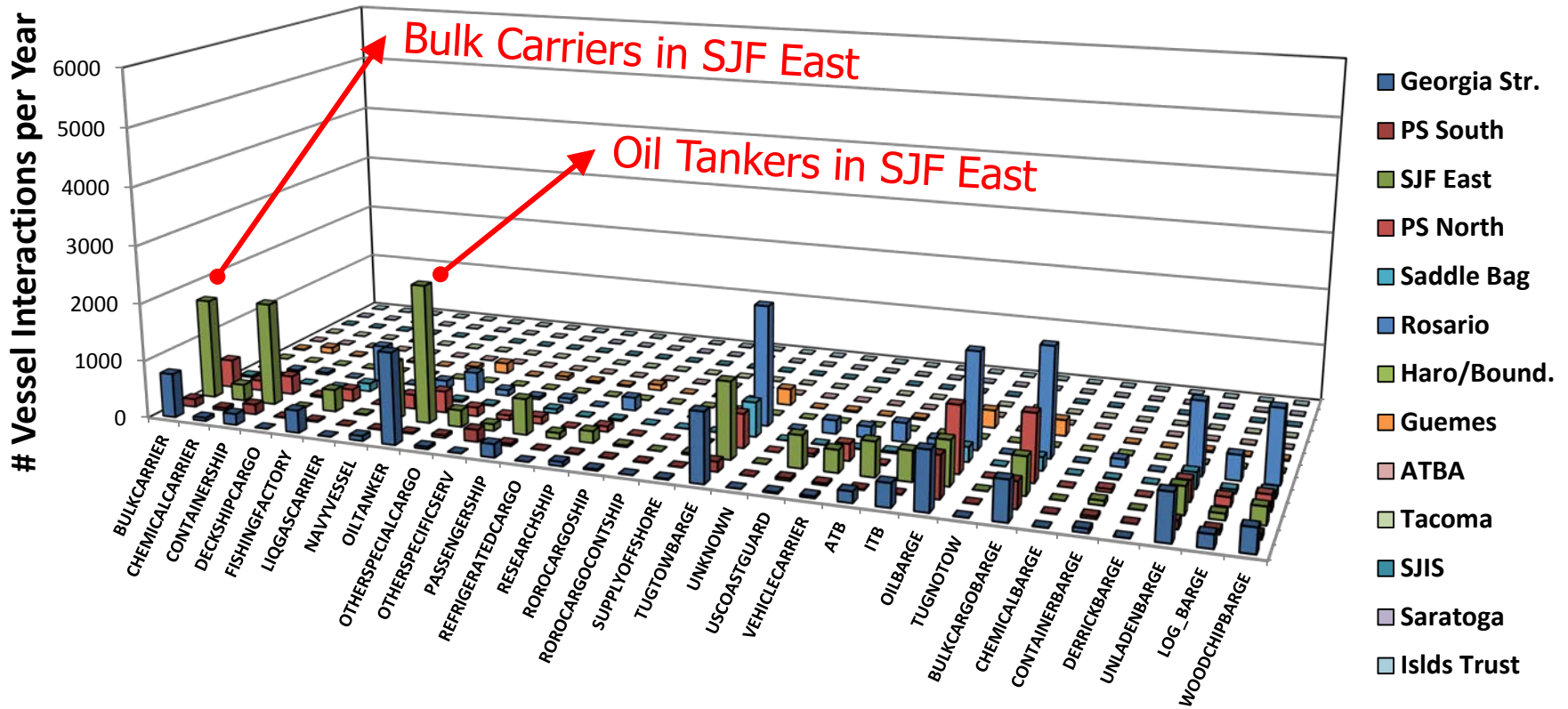
2005 Focus Vessels: Oil Tanker, ATB, ITB



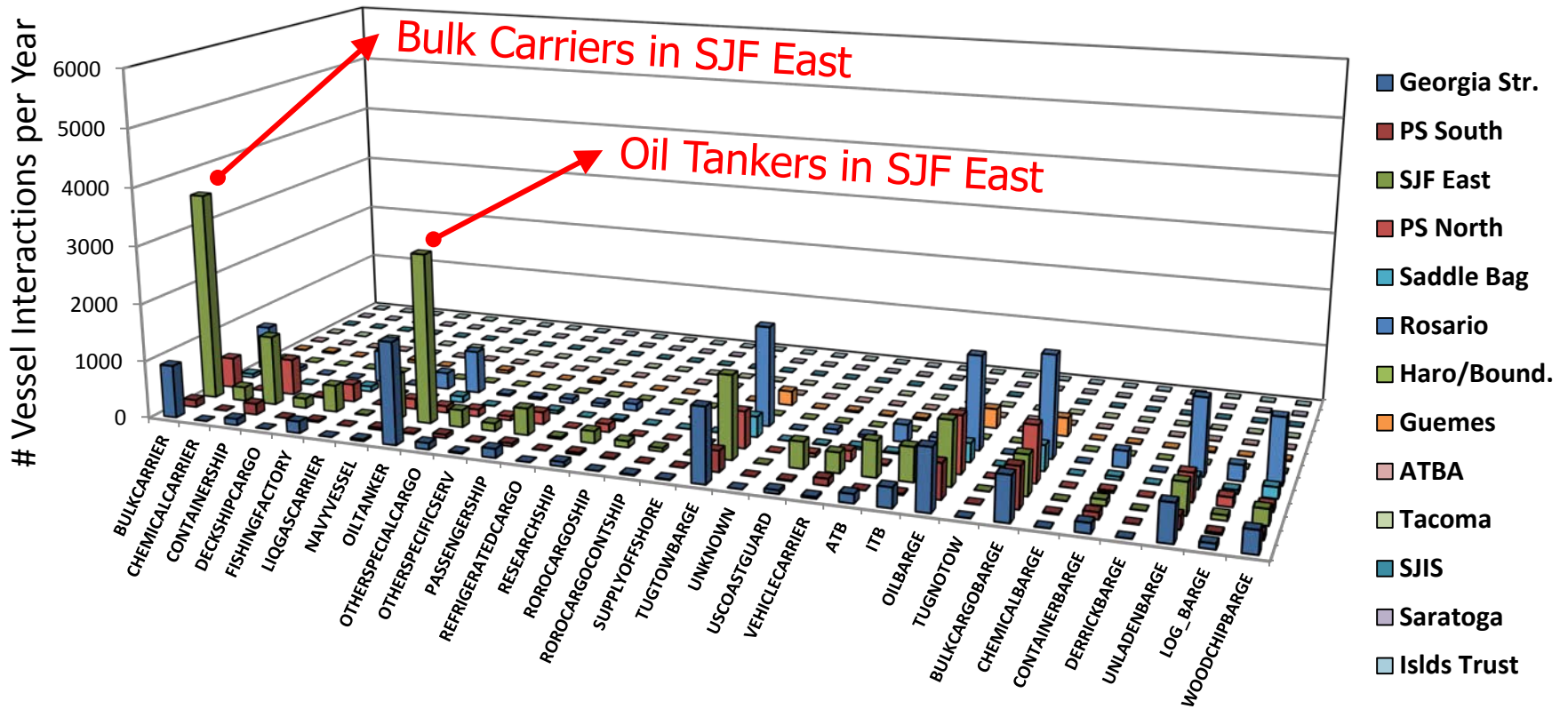
Case: No Gateway - 2005 FV's: Oil Tanker, ATB, ITB



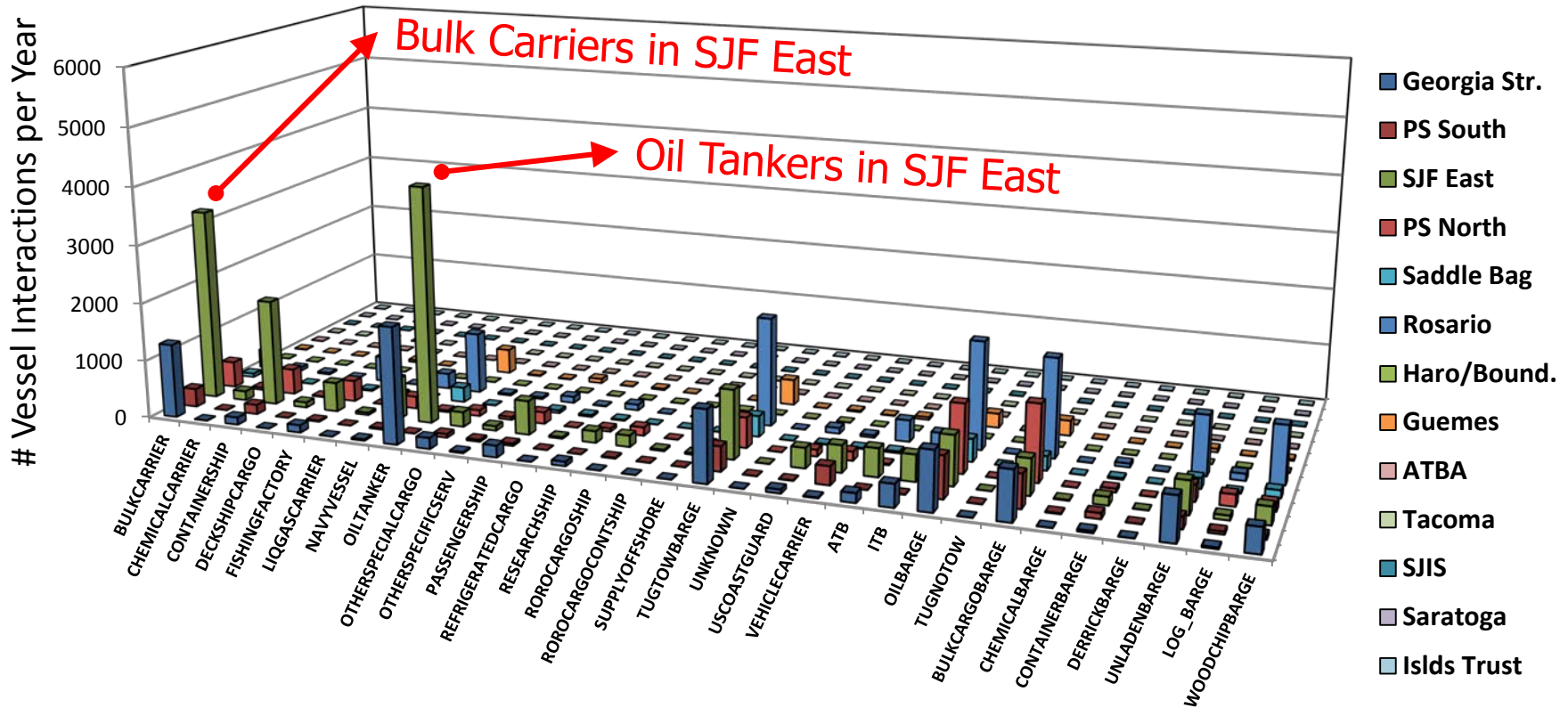
Case: No Gateway - 2005 FV's: Oil Tanker, ATB, ITB
 (Excluding WSJF, BUOY J, Ferries, Fishing, Whale watching and Yachts)



**Case: + 240 Gateway - No Haro North for Gateway 2005 FV's: Oil Tanker, ATB, ITB
(Excluding WSJF, Buoy J, Ferries, Fishing, Whale watching and Yachts)**

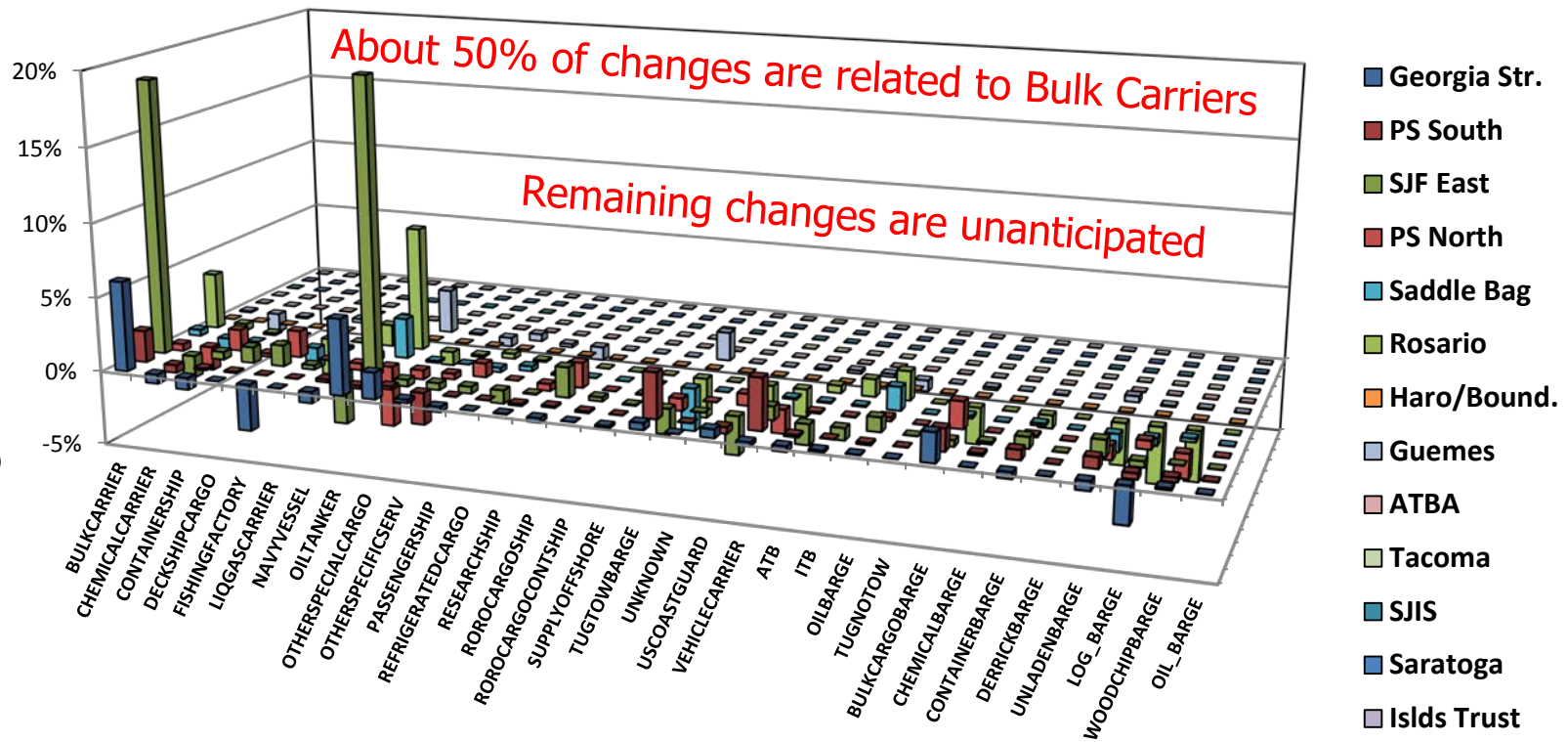


**Case: + 240 Gateway - Yes Haro North for Gateway 2005 FV's: Oil Tanker, ATB, ITB
(Excluding WSJF, Buoy J, Ferries, Fishing, Whale watching and Yachts)**

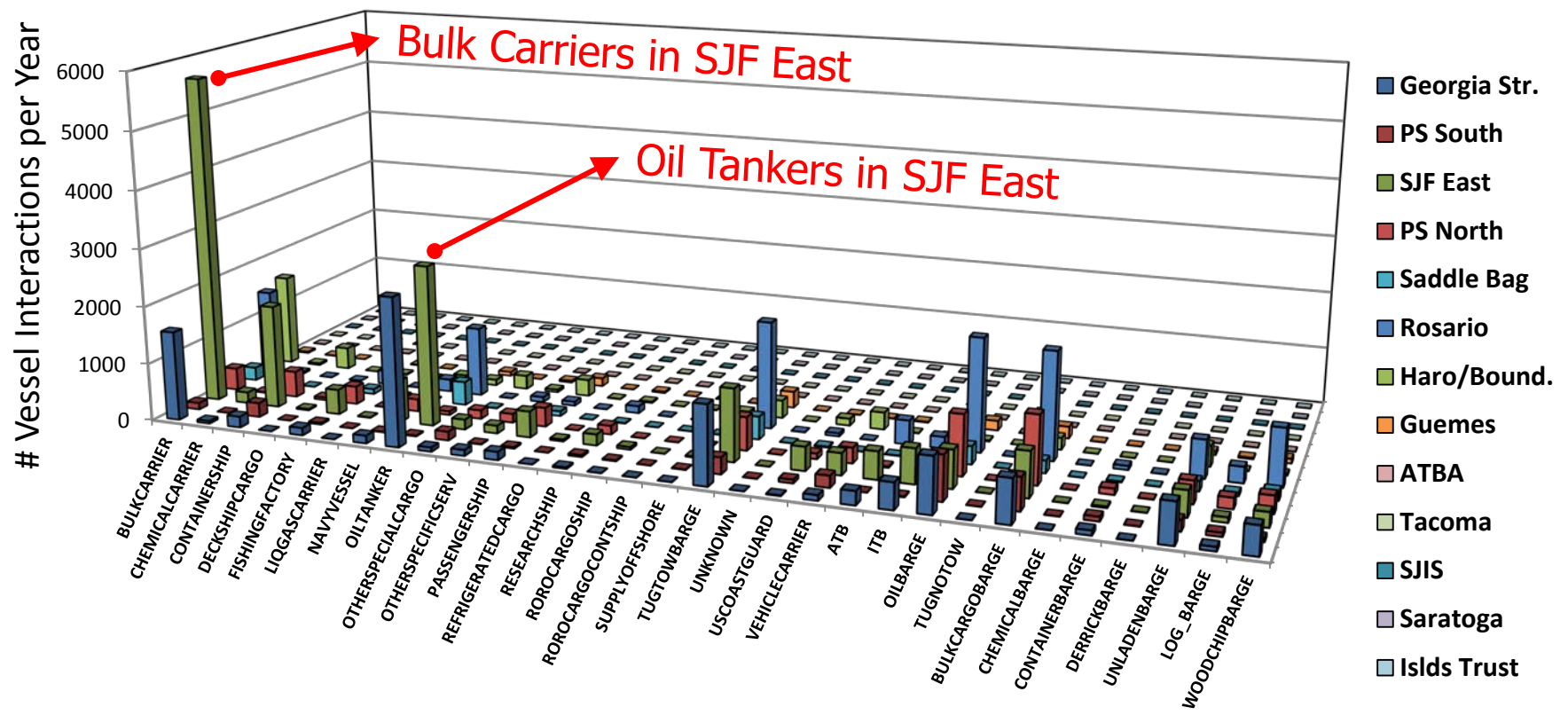


Case: + 240 Gateway - Yes Haro North for Gateway 2005 FV's: Oil Tanker, ATB, ITB (Excluding WSJF, Buoy J, Ferries, Fishing, Whale watching and Yachts)

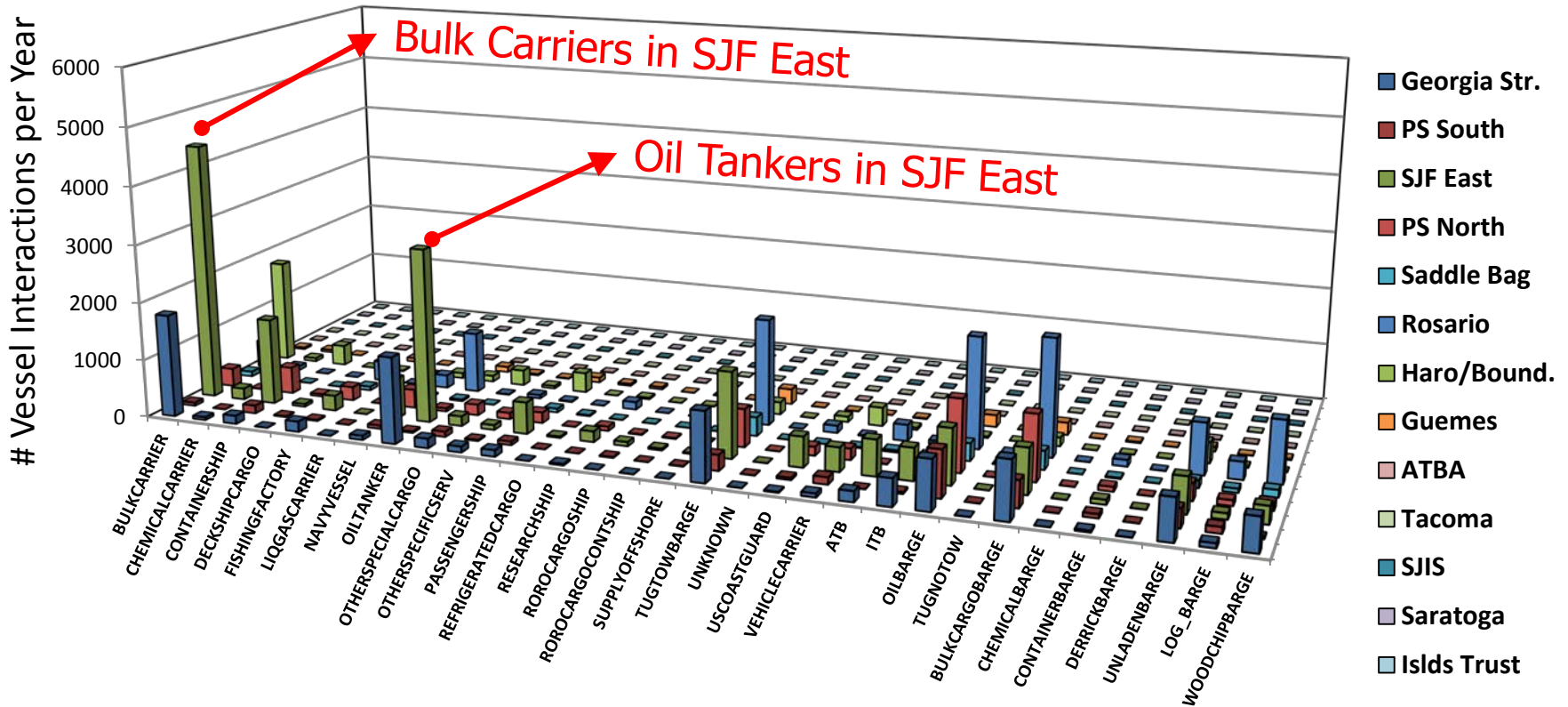
% Change in Vessels Interactions from Total
Change from Base Case



**Case: + 480 Gateway - No Haro North for Gateway 2005 FV's: Oil Tanker, ATB, ITB
(Excluding WSJF, Buoy J, Ferries, Fishing, Whale watching and Yachts)**



**Case: + 480 Gateway - Yes Haro North for Gateway 2005 FV's: Oil Tanker, ATB, ITB
(Excluding WSJF, Buoy J, Ferries, Fishing, Whale watching and Yachts)**



VTRA CASE B: Year 2005 with north wing

100% of Case B Total

28%

11%

Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

**Base Case:
No Gateway**

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

2005 Interacting Vessel (IV):
Bulk Carriers

VTRA CASE B: Year 2005 with north wing

125% of Case B Total

44%

18%

Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

Case: + 240 Gateway
NO North Haro Route

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

2005 Interacting Vessel (IV):
Bulk Carriers

VTRA CASE B: Year 2005 with north wing

122% of Case B Total

43%

17%

Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

Case: + 240 Gateway YES North Haro Route

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

2005 Interacting Vessel (IV):
Bulk Carriers

VTRA CASE B: Year 2005 with north wing

125% of Case B Total

44%

18%

Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

Case: + 240 Gateway
NO North Haro Route

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

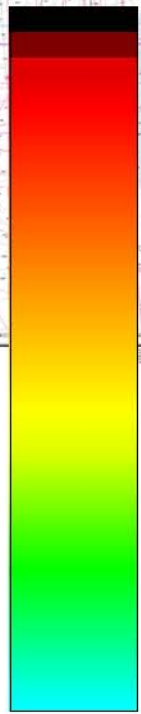
2005 Interacting Vessel (IV):
Bulk Carriers

VTRA CASE B: Year 2005 with north wing

161% of Case B Total

66%

28%



Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

Case: + 480 Gateway
NO North Haro Route

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

2005 Interacting Vessel (IV):
Bulk Carriers

VTRA CASE B: Year 2005 with north wing

145% of Case B Total

57%

22%

Factor x Average Exposure:

- > 6.43
- > 6.43
- 6.43
- 3.00
- 2.53
- 2.23
- 2.00
- 1.81
- 1.65
- 1.51
- 1.39
- 1.28
- 1.18
- 1.09
- 1.00
- 0.83
- 0.67
- 0.53
- 0.41
- 0.30
- 0.19
- 0.09
- 0.00

Geographic Profile of FV-IV interactions for 2005:

Case: + 480 Gateway YES North Haro Route

2005 Focus Vessels (FV):
Oil Tanker, ATB and ITB

2005 Interacting Vessel (IV):
Bulk Carriers

SUMMARY ANALYSIS OF GEOGRAPHIC PROFILES OF BULK CARRIER INTERACTIONS WITH FOCUS VESSEL GROUP: TANKERS, ATB'S AND ITB'S

TABLE:

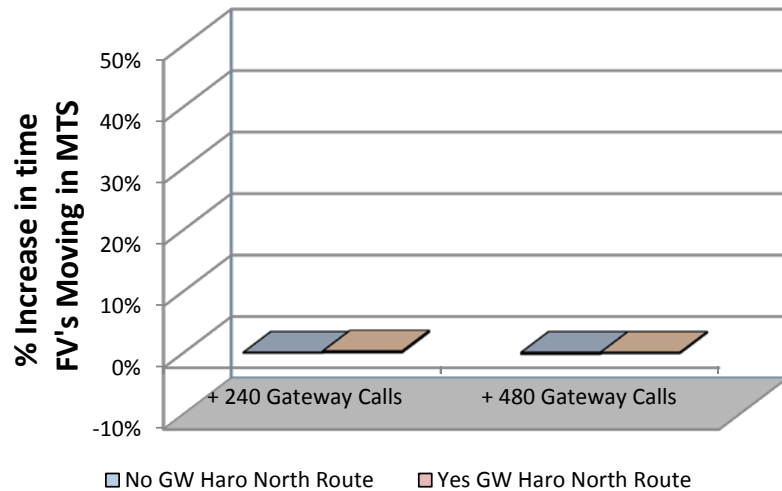
**Percentage of TOTAL VTRA Case B Interactions of Focus Vessels with Bulk Carriers,
where Focus Vessels are Tankers, ATB's and ITB'S**

Area	VTRA Case B - 2005	+ 240 GW, NO Haro North	+ 240 GW, YES Haro North	+ 480 GW, NO Haro North	+ 480 GW, YES Haro North
Complete Study Area	100%	125%	122%	161%	145%
Outside Large Red Square	72%	81%	79%	95%	88%
Large Red Square	28%	44%	43%	66%	57%
Outside Small Red Square, within Large Red Square	17%	26%	26%	38%	35%
Small Red Square	11%	18%	17%	28%	22%

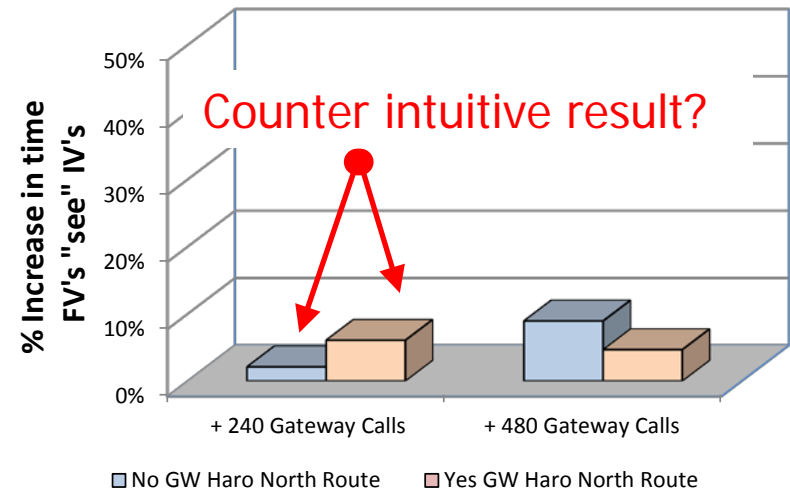
2005 VTRA DATA FOCUS VESSEL SCENARIO 3: OIL TANKERS, ATB's and ITB's

Table A	A route interaction % change analysis of focus vessels and a vessel interaction % chance				
VTRA 2005	analysis of focus vessels with other modeled traffic from base case in VTRA simulation model				
Focus Vessels:	Base Case	Case 1	Case 2	Case 3	Case 4
Oil Tanker, ATB, ITB	NG	YG - NH 240	YG - YH 240	YG - NH 480	YG - YH 480
Gateway	No	Yes	Yes	Yes	Yes
North through Haro	N/A	No	Yes	No	Yes
Additional Calls	N/A	≈ 240	≈ 240	≈ 480	≈ 480
Route Interactions	100.0%	99.9%	100.2%	99.7%	99.9%
Vessel Interactions	100.0%	102.1%	106.1%	109.0%	104.7%

2005 Focus Vessels: Oil Tanker, ATB, ITB



2005 Focus Vessels: Oil Tanker, ATB, ITB



Graph Explanation

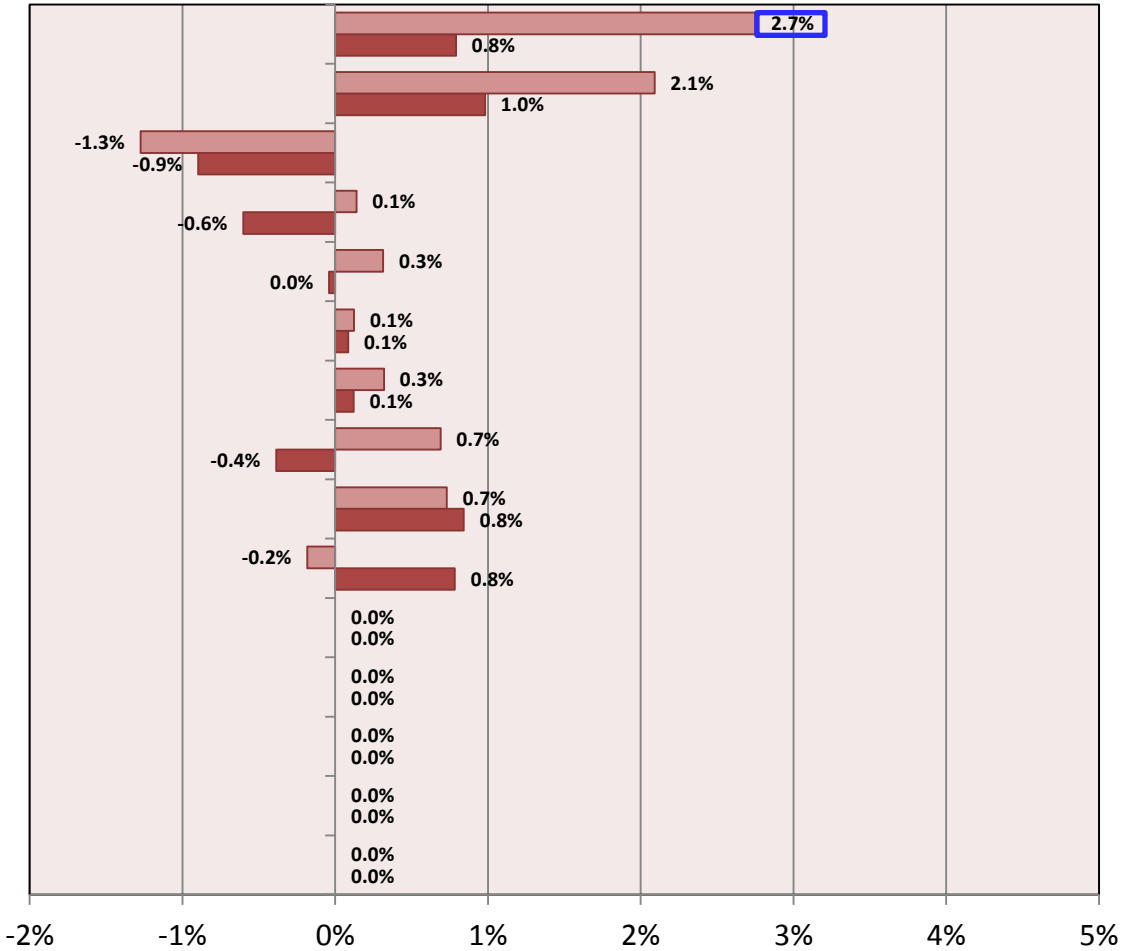
22.7% of these FV to IV interactions in Base Case Occur in **SJF West** in 2005

VTRA Case: + 240 GW with Haro North this increases to 22.7% + 2.7% = 25.4% of these FV to IV interactions in Base Case

100.0% of Total Time in Base Case that these FV's "see" these IV's

2005 VTRA Case: + 240 Gateway Calls FV's: Oil Tanker, ATB, ITB IV's: All Vessels

- (22.7%) - SJF West
- (18.4%) - SJF East
- (18.2%) - Rosario
- (9.8%) - Georgia Str.
- (6.3%) - Haro/Bound.
- (6.2%) - Buoy J
- (5.9%) - PS North
- (4.6%) - Guemes
- (4.1%) - PS South
- (3.8%) - Saddle Bag
- (0.0%) - Islds Trust
- (0.0%) - Tacoma
- (0.0%) - Saratoga
- (0.0%) - SJIS
- (0.0%) - ATBA



% Change from Total Time in Base Case that FV's "see" IV's by Location

■ Yes GW Haro North Route ■ No GW Haro North Route

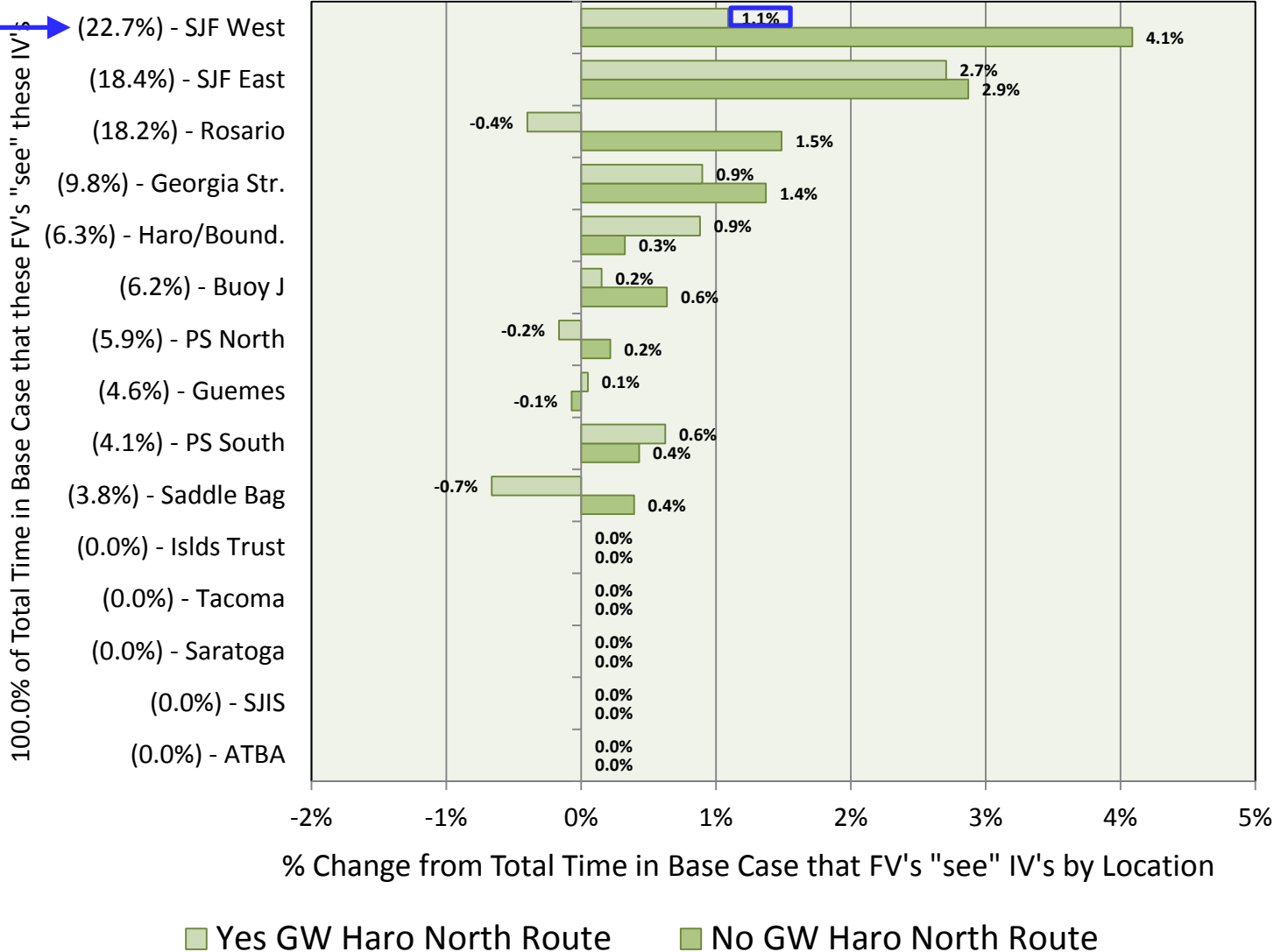
Graph Explanation

22.7% of these FV to IV interactions in Base Case Occur in **SJF West** in 2005

VTRA Case: + 480 GW with Haro North this increases to 22.7% + 1.1% = 23.8% of these FV to IV interactions in Base Case

2005 VTRA Case: + 480 Gateway Calls

FV's: Oil Tanker, ATB, ITB IV's: All Vessels



FOCUS VESSELS (FV's): OIL TANKER, ATB, ITB IN VTRA 2005

Rank	% of Total Time that FV "sees" an IV in Base Case by Location	Cumulative% of Total Time that FV "sees" an IV in Base Case by Location	% Change from total time that FV "sees" an IV in Base Case			
			+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(22.7%) - SJF West	22.7%	0.8%	2.7%	4.1%	1.1%
2	(18.4%) - SJF East	41.1%	1.0%	2.1%	2.9%	2.7%
3	(18.2%) - Rosario	59.4%	-0.9%	-1.3%	1.5%	-0.4%
4	(9.8%) - Georgia Str.	69.1%	-0.6%	0.1%	1.4%	0.9%
5	(6.3%) - Haro/Bound.	75.4%	0.0%	0.3%	0.3%	0.9%
6	(6.2%) - Buoy J	81.6%	0.1%	0.1%	0.6%	0.2%
7	(5.9%) - PS North	87.5%	0.1%	0.3%	0.2%	-0.2%
8	(4.6%) - Guemes	92.1%	-0.4%	0.7%	-0.1%	0.1%
9	(4.1%) - PS South	96.2%	0.8%	0.7%	0.4%	0.6%
10	(3.8%) - Saddle Bag	100.0%	0.8%	-0.2%	0.4%	-0.7%
11	(0.0%) - Islds Trust	100.0%	0.0%	0.0%	0.0%	0.0%
12	(0.0%) - Tacoma	100.0%	0.0%	0.0%	0.0%	0.0%
13	(0.0%) - Saratoga	100.0%	0.0%	0.0%	0.0%	0.0%
14	(0.0%) - SJIS	100.0%	0.0%	0.0%	0.0%	0.0%
15	(0.0%) - ATBA	100.0%	0.0%	0.0%	0.0%	0.0%

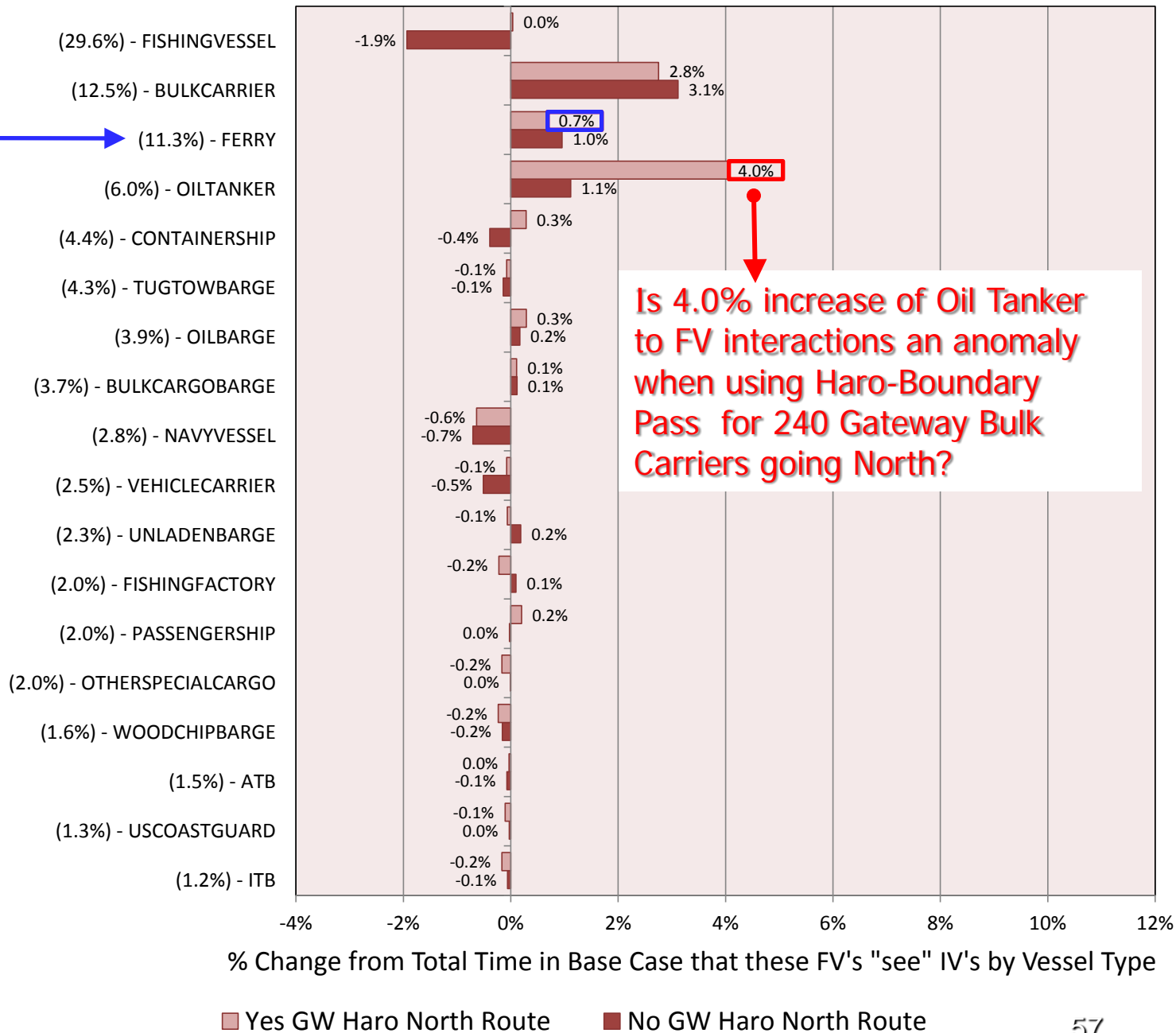
Graph Explanation

11.3% of these FV to IV interactions in Base Case are **with Ferries** in 2005

VTRA Case: + 240 GW with Haro North this increases to 11.3% + 0.7% = 12.0% of these FV to IV interactions in Base Case

2005 VTRA Case: + 240 Gateway Calls Focus Vessels: Oil Tanker, ATB, ITB

94.8% of Total Time in Base Case that these FV's "see" these IV's



Is 4.0% increase of Oil Tanker to FV interactions an anomaly when using Haro-Boundary Pass for 240 Gateway Bulk Carriers going North?

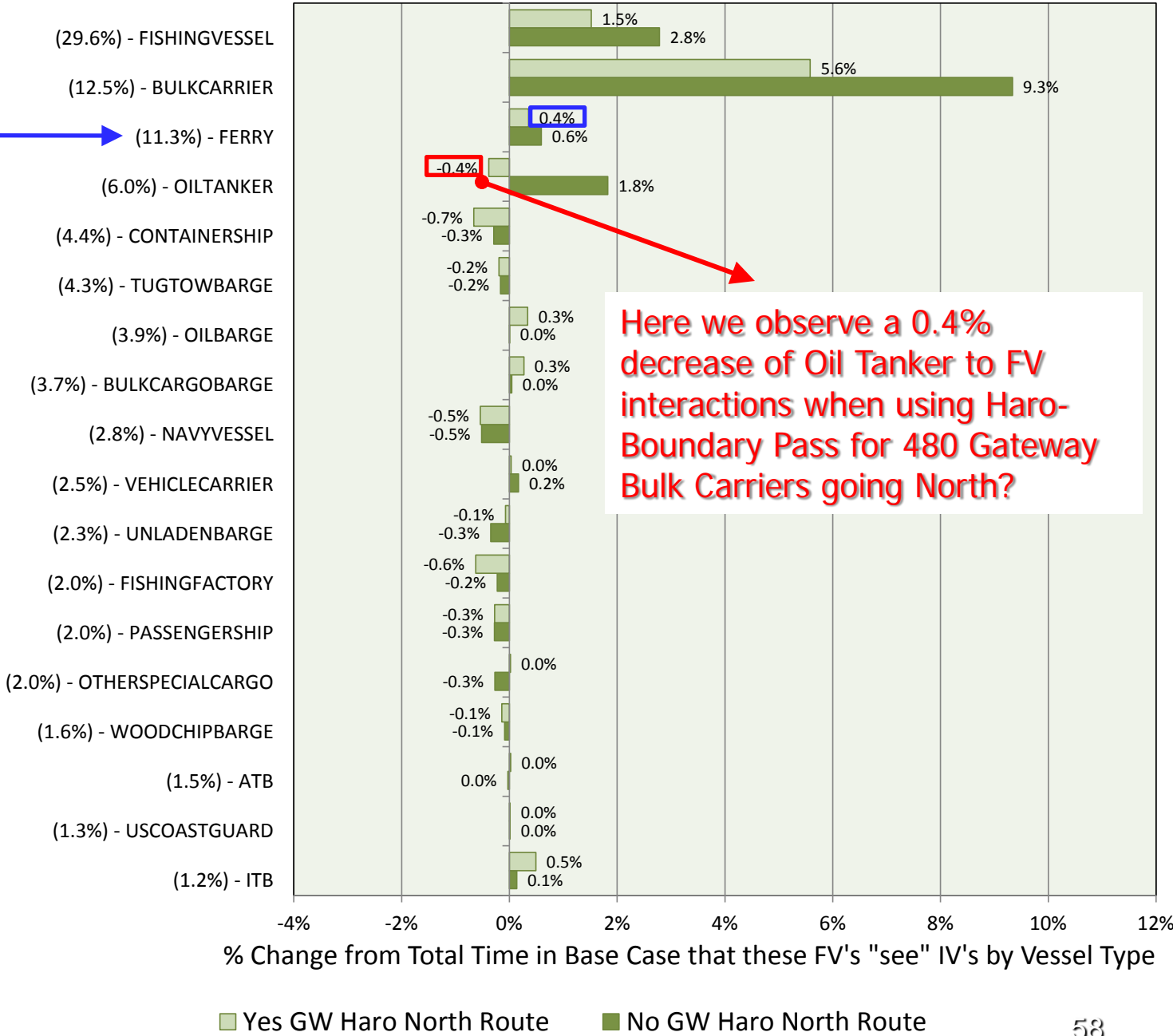
Graph Explanation

11.3% of these FV to IV interactions in Base Case are **with Ferries** in 2005

VTRA Case: + 480 GW with Haro North this increases to 11.3% + 0.4% = 11.7% of these FV to IV interactions in Base Case

2005 VTRA Case: + 480 Gateway Calls Focus Vessels: Oil Tanker, ATB, ITB

94.8% of Total Time in Base Case that these FV's "see" these IV's



Here we observe a 0.4% decrease of Oil Tanker to FV interactions when using Haro-Boundary Pass for 480 Gateway Bulk Carriers going North?

FOCUS VESSELS (FV's): OIL TANKERS, ATB, ITB IN VTRA 2005

Rank	% of Total Time that FV "sees" an IV in Base Case by Vessel Type	Cumulative% of Total Time that FV "sees" an IV in Base Case by Vessel Type	% Change from total time that FV "sees" an IV Case in Base			
			+ 240 GW - No GW Haro North Route	+ 240 GW - Yes GW Haro North Route	+ 480 GW - No GW Haro North Route	+ 480 GW - Yes GW Haro North Route
1	(29.6%) - FISHINGVESSEL	29.6%	-1.9%	0.0%	2.8%	1.5%
2	(12.5%) - BULKCARRIER	42.1%	3.1%	2.8%	9.3%	5.6%
3	(11.3%) - FERRY	53.3%	1.0%	0.7%	0.6%	0.4%
4	(6.0%) - OILTANKER	59.3%	1.1%	4.0%	1.8%	-0.4%
5	(4.4%) - CONTAINERSHIP	63.7%	-0.4%	0.3%	-0.3%	-0.7%
6	(4.3%) - TUGTOWBARGE	68.0%	-0.1%	-0.1%	-0.2%	-0.2%
7	(3.9%) - OILBARGE	71.9%	0.2%	0.3%	0.0%	0.3%
8	(3.7%) - BULKCARGOBARGE	75.6%	0.1%	0.1%	0.0%	0.3%
9	(2.8%) - NAVYVESSEL	78.3%	-0.7%	-0.6%	-0.5%	-0.5%
10	(2.5%) - VEHICLECARRIER	80.9%	-0.5%	-0.1%	0.2%	0.0%
11	(2.3%) - UNLADENBARGE	83.2%	0.2%	-0.1%	-0.3%	-0.1%
12	(2.0%) - FISHINGFACTORY	85.2%	0.1%	-0.2%	-0.2%	-0.6%
13	(2.0%) - PASSENGERSHIP	87.2%	0.0%	0.2%	-0.3%	-0.3%
14	(2.0%) - OTHERSPECIALCARGO	89.2%	0.0%	-0.2%	-0.3%	0.0%
15	(1.6%) - WOODCHIPBARGE	90.8%	-0.2%	-0.2%	-0.1%	-0.1%
16	(1.5%) - ATB	92.3%	-0.1%	0.0%	0.0%	0.0%
17	(1.3%) - USCOASTGUARD	93.6%	0.0%	-0.1%	0.0%	0.0%
18	(1.2%) - ITB	94.8%	-0.1%	-0.2%	0.1%	0.5%

LESSONS LEARNED FROM PRELIMINARY 2005 GATEWAY ANALYSIS

1. Exposure results change when the focus vessel designation changes.

Conclusion: We need a specified group of focus vessels for 2010 VTRA

Suggestion: Include only those vessels in Focus Vessel Group that are expected to experience **increases or decreases** over the next 10 years due to **planned changes** in the Maritime Transportation System

Bulk carriers	(Gateway),
Oil Tankers	(Kinder Morgan),
ATB's	(Kinder Morgan),
ITB's	(No more ITB's?),
Oil Barges	(Kinder Morgan),
Container Vessels.	(????)

PLEASE BEAR IN MIND THAT:

A too large a focus vessel group will cause computational complexities